VOL. 15. NO. 7 Registered in U. S. Patent Office JULY, 1917

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED

THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:

ELECTRO-PLATERS REVIEW.

$1.00 Per Year 99 JOHN STREET, NEW YORK 10 Cents Per Copy

A MONTHLY JOURNAL RELATING TO THE METAL AND PLATING TRADES

Contents, Page 307 Directories, Page 63 Want Ads., Page 73 Index to Advertisements, Page 83

THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW.

Vol. 15. NEW YORK, JULY, 1917. No. 7.

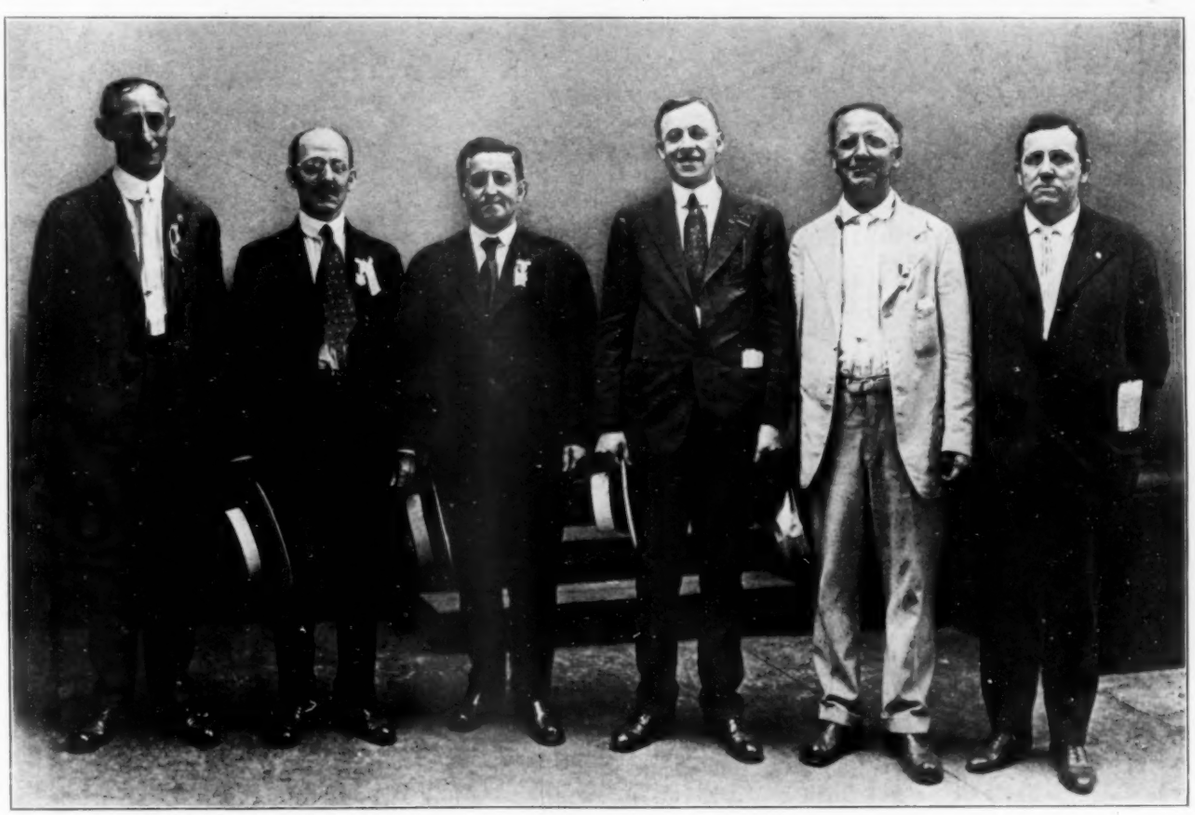
AMERICAN ELECTRO PLATERS' CONVENTION

A DESCRIPTION OF THE FIFTH ANNUAL MEETING HELD IN ST. LOUIS, MO., AT THE PLANTERS HOTEL JULY 5, 6 AND 7, 1917.

WRITTEN FOR THE METAL INDUSTRY BY ROY M. EDMONDS.

INTRODUCTION.

The fifth annual convention of the American Electro Platers Society, which met in St. Louis July 5, 6 and 7, was the largest and regarded by all who were present as the most successful convention ever held by this organization. Not only was the attendance greater than at any previous convention of the society, but the display of exhibits was on a far more extensive scale and the class of papers read and discussions which followed were of a higher grade. The educational features—always the most important feature of the platers' conventions—were of greater brilliance than ever before, and it is expected that the instruction thus afforded at the convention and the spirit of co-operation and good fellowship shown by all of the members will result in great good.



OFFICERS OF AMERICAN ELECTRO PLATERS' SOCIETY FOR 1917-18. FROM LEFT TO RIGHT, THEY ARE WALTER S. FRAINE, DAYTON BRANCH, PRESIDENT; GEORGE B. HOGABOOM, BRIDGEPORT, CONN., BRANCH, FIRST VICE-PRESIDENT; W. J. SALMON, TORONTO, ONT., BRANCH, SECOND VICE-PRESIDENT; OSCAR E. SERVIS, CHICAGO BRANCH, SECRETARY-TREASURER; H. J. RICHARDS, ST. LOUIS BRANCH, EDITOR OF BULLETIN, AND H. H. WILLIAMS, ST. LOUIS BRANCH, PAST PRESIDENT.

The entertainment features were not neglected at this convention because of the important business and educational matters discussed, but on the contrary, were also on a more extensive scale than at previous gatherings. This was made possible by holding one day's ses-

sion on board a Mississippi river steamboat, which gave the delegates and members an opportunity to combine business, pleasure and instruction. The boat ride, in which the ladies took part, enabled the members to become better acquainted, in addition to having the enjoyment of a thirty-mile trip up the beautiful Mississippi river, and was generally regarded as capital idea. It was an all-day outing, and always will stand out as a most enjoyable feature of any convention.

There were other entertainment features, including an automobile trip, of three hours through the parks of St. Louis, with a visit to the Missouri Botanical (Shaw's) Gardens, the largest botanical gardens in the United States, and the City Art Museum in Forest Park, and a banquet on the evening of July 7, which brought the convention to a brilliant close.

The first day of the convention was devoted to business and educational sessions at the Planters Hotel in the morning and evening, and an automobile trip in the afternoon to the various plating plants. The entertainment features for the ladies that day were a luncheon, tour of the shopping district and a trolley car party in the evening. Friday, the second day, came the boat ride, with an educational session at the Planters Hotel in the evening, while the ladies were entertained at an evening reception given by the Women's Council of St. Louis.

The business of the convention was ended Saturday morning, with the election of officers and the selection of the next meeting place, with a sightseeing auto trip in the afternoon.

In the election of officers and in the selection of the meeting place for 1917 there were no contests, except as to the honor of who would place the various men in nomination. Detroit was selected as the place for the next convention. Philadelphia put in a bid for the meeting of the society in 1919, and the application of that city was looked upon with general favor.

These officers were elected—all regarded as most capable men and who will reflect great credit upon the organization:

President, Walter Fraine, Dayton, Ohio, branch.
First vice-president, George Hogaboom, Bridgeport, Conn., branch.

A PANORAMIC VIEW OF THE DELEGATES, MEMBERS AND GUESTS OF THE AMERICAN ELECTRO-PLATERS SOCIETY

Second vice-president, W. J. Salmon, Toronto, Ont., branch.
Secretary-treasurer, Oscar E. Servis, Chicago, Ill., branch.
Editor of Official Bulletin, H. J. Richards, St. Louis, Mo., branch.
Past President, H. H. Williams, St. Louis, Mo., branch.

An impressive feature of the final business session was the presentation of the society of an embossed leather tablet to W. S. Barrows, past president, of the Toronto branch. The presentation speech, which was regarded as the oratorical gem of the convention, was made by Mr. Hogaboom. Mr. Barrows was unable to be present, and the tablet was entrusted to Mr. Salmon for delivery to him. Mr. Hogaboom dwelt at length upon the services Mr. Barrows had given to the society and the hard work

in the matter of research and praised him for his unselfish devotion.

THE CONVENTION PROCEEDINGS.

After the registration of delegates had been completed Thursday morning, the society was called to order by H. H. Williams of St. Louis, President of the Society. All of the officers were present, with the exception of W. G. Stratton of Bridgeport, Conn., second vice-president. The report of the executive board, which passed on the credentials of the delegates, was the first business before the convention. The report was adopted. The minutes of the fourth annual session, which was held in Cleveland, O., July 6, 7 and 8, 1916, were read and approved.

AT THE FIFTH ANNUAL CONVENTION AT ST. LOUIS, MISSOURI, JULY 5-6-7, 1917. THIS PHOTOGRAPH WAS TAKEN

President Williams surrendered the gavel to H. J. Richards, President of the St. Louis branch of the society, who presided for the remainder of the day.

Mr. Richards welcomed the delegates on behalf of the St. Louis branch, extending them most cordial greetings. He introduced J. Lionberger Davis, President of the St. Louis Chamber of Commerce, who gave the visitors a hearty welcome on behalf of the city. Mr. Davis told of the advantages of St. Louis, as a point of accessibility for conventions and as a distributing center. He said that national conventions should be held as usual during the war period, because they fostered a spirit of cooperation, which he said was needed in this country more than we ever did. "In a time like this," he said, "every man, every woman ought to feel an individual responsibility and must feel that they must co-operate to the fullest with other men and women in this country." Mr. Davis, commenting on the cool weather, said that St. Louis had given the Electro-Platers the best it had. He extended an invitation to the members of the society to use the facilities of the Chamber of Commerce to the fullest.

The response to Mr. Davis' address of welcome was delivered by Walter Fraine, Dayton, O., secretary and treasurer. A rising vote of thanks was given Mr. Davis.

The reports of the President and Secretary were read and approved.

Mr. Fraine reported that the treasury of the society is in better condition than at any previous period. All balances due from branch societies at the end of 1915-'16 have been paid in full, and all balances due the Supreme society have been paid in during the last month, thus placing the society in a better financial position than at any time in its history. The report of the treasurer was read, and referred to an auditing committee composed of O. E. Servis, H. J. Ter Doest and W. J. Salmon.

H. J. Richards submitted the report of the editor, which told of the various papers that had been printed in the bulletin and of the successful efforts to obtain second class postage rates for this publication.

On motion of Charles H. Proctor, it was ordered that the secretary send a telegram to the President of the United States again offering the co-operation of the society and of every member of the society in every way possible. It also was voted to send a telegram of greeting to F. C. Rushton, a member of the St. Louis branch, now at Fort Riley, Kan., with the Officers' Reserve Corps.

The convention adjourned until 8 P. M. A group photograph of the delegates (shown in this issue of THE METAL INDUSTRY) was taken on the steps of the historic St. Louis courthouse. At 12:15 P. M. a luncheon was given for the ladies of the convention, followed by a bird's eye view of the city from the roof of the 21-story Railway Exchange building, and a tour of the shopping district. At 1:30 P. M., the delegates were taken in autos on a visit to various plating shops of St. Louis. The plants of Buck's Stove, Majestic Manufacturing Co., St. Louis Brass Co., Quick Meal Stove Co., Koken Barbers' Supply Co., Musick's Plating Works and St. Louis Coffin Co.

ON THE STEPS OF THE HISTORIC OLD COURT HOUSE OF ST. LOUIS. IF YOU HAVE NOT LOCATED

While the men were having an educational session in the evening, at which Mr. Richards presided, a trolley parlor car trip was given for the benefit of the ladies of the party. At the educational session papers were read by Floyd T. Taylor, of Chicago, Western Manager for Hunning-Loeb Co., on "Electro-plating Generators," and E. W. Heil of the Coleman Lamp Co., Wichita, Kan., on "Resistance of Nickel Solutions." Dr. W. Blum of the Bureau of Standards, Washington, D. C., also made an informal talk.

Entertainment as well as business and educational sessions were combined Friday, the second day of the convention, when the meetings were held on board of the Belle of the Bends, which went thirty miles up the Mississippi River and into the even more picturesque Illinois River. This was one of the most enjoyable features of the convention. Most of the sessions were held on the upper deck of the boat, where it was delightfully cool and where the beautiful scenery could be enjoyed best.

The boat left the foot of Olive Street at 9:30, and after the visitors had taken advantage of the opportunity to see the industries of St. Louis and East St. Louis, Ill., along the river, the business sessions were taken up in earnest. Mr. Williams again was in the chair.

Several proposed changes in the by-laws were discussed, and the convention took up the suggestion of Dr. W. Blum of the Bureau of Standards, and decided to appoint a committee of three to work in connection with that bureau and to be known as a Board of Standardization, and to raise a fund to be used by the bureau in research work along electro-plating lines. Great enthusiasm was shown in this matter, and the resolution was adopted by a unanimous vote.

After lunch, the convention reassembled, with Mr. Richards presiding. Several amendments to the by-laws were discussed, and the remainder of the afternoon was devoted to the educational features of the convention. The principal paper was read by Edwin C. Scott, consulting chemist of the service department of The Solvay Process Co., Syracuse, N. Y., who discussed "Principles of Modern Metal Cleansing." H. J. Ter Doest, of Akron, O., read a paper on "Boosting the Output of a Brass Solution," and William Salmon read his paper on "Estimation of Silver in Cyanide Solutions." Charles H. Proctor of New York read the following papers, which

had been prepared by members of the New York branch of the society: "Galvano Work on Plaster of Paris," R. P. Massicott; "Electro Plating Finish on Casket Hardware," "Imperfect Metal Deposits," Joseph Haas, Jr.; "Plating Antimonial Lead Fixture Work Without Scratch Brushing," John Burke; "Nickeling of Nickel," Frank Duffy, and "Suggestions," William Vose.

The remainder of the afternoon was devoted to dancing, and the further enjoyments of the beautiful scenery along the Mississippi. A quartet of negroes sang popular songs, and several impromptu quartets were organized among the members of the society. The boat ride was a novel treat for most of the members, and all thoroughly enjoyed it. The entertainment features lasted throughout the trip, giving the ladies, the younger people and others not interested in the strictly business and educational sessions an opportunity to enjoy themselves.

The party landed in St. Louis at 7 o'clock, tired out, but ready and eager to resume the work at the evening session.

At Friday night's educational session papers were read by R. J. Hazucha of Chicago on "Nickel and Brass Plating of Die Castings," by Joseph Walters; on "Nickel Plating Stove Castings," and "Factors of Importance in Silver Plating," by F. C. Mesle, plating engineer of Oneida Community, Sherrill, N. Y., and by Charles C. Martel of Chicago on "In the Plating Department."

On Saturday morning, a paper by Jerry de Grazia of Valparaiso, Ind., on "Direct Steel Plating" was read.

A patriotic note was given to the banquet, which was held in the dining room of the Planters Hotel July 7th, by the singing of "America." H. H. Williams, Past President of the society, acted as toastmaster until he turned the gavel over to his successor after the installation of officers. The officers were installed by Charles H. Proctor, the founder of the society. Mr. Proctor took especial occasion to compliment Mr. Williams for the able manner in which he had conducted the chief executive office of the A. E. S. during the last year. A stirring feature of the installation was the patriotic reference to the alliance of Canada and United States and the war in the installation of Mr Salmon, of Toronto.

YOURSELF BY THIS TIME, YOU WILL HAVE TO GO BACK AND LOOK ALL OVER AGAIN.

Mr. Fraine's topic was "The Future of the American Electro Platers Society." T. W. Van Schoiack, formerly sales manager for the Koken Barbers' Supply Company, but now a captain in the Quartermaster's Department of the United States Army, discussed "The Relation of the Electro-Platers to Our Commercial Interests." Former Judge Thomas L. Anderson, of St. Louis, delivered a patriotic address on "Our Flag," and informal talks were made by Dr. W. Blum, of the United States Department of Standardization; E. W. Heil, of Wichita, Kans., and H. J. Richards.

Still another patriotic feature of the banquet was the appearance as a guest of F. C. Rushton, a member of the St. Louis branch, who is in training with the Officers' Reserve Corps, at Fort Riley, Kansas. Mr. Rushton's coming on a leave of absence was a surprise.

RESULTS OF INVESTIGATIONS IN METAL WORKING

Two Papers Presented at the Annual Meeting of the American Society for Testing Materials, Atlantic City, N. J., June 24 to 29, 1917.

By W. Reuben Webster.

LIGHT VERSUS HEAVY REDUCTIONS IN COLD WORKING BRASS.

In a paper entitled "An Investigation Leading to Specifications for Brass Condenser Tubes," by Prof. A. E. White, delivered at the last annual meeting of the Society, the statement was made that: "It is likewise more desirable to reduce the thickness of the tube by many light drafts than by a few heavy drafts. Such procedure guarantees more thorough and uniform kneading and interlocking of the tube grains."

In the discussion the writer called attention to the fact that no evidence was presented in support of this statement, and that it was contrary to established practice. The proper degree of reduction is later defined by Professor White as one "which should only be just heavy enough to work the metal all the way through" without defining any method of determining what constitutes that degree. It is quite certain that experienced brass workers could not make such a determination. It is felt by the writer that if there was a difference in results obtained by a series of relatively light passes as compared with one heavy pass effecting the same total reduction, the fact could readily be determined. In order to obtain some data on the subject, the following experiments were performed:

W. R. WEBSTER.

A sample of cartridge metal was rolled down to approximately 0.200 in. thick and very carefully annealed. This sample was then cut into two pieces. Sample No. 1 was rolled to 0.098 in. thick in one pass, while sample No. 2 was rolled to precisely the same thickness in six passes. From each piece three test samples were cut and submitted to physical test with the results shown in Table I. A microscopic examination was also made, as shown by Figs. 1 and 2, the former representing sample No. 1 and the latter No. 2. It is evident from both the physical tests and microscopic examination that the only difference between the material which was given six passes and that which was given but one pass is that the latter has a higher tensile strength and slightly lower elongation.

Table I.—Tests of Rolled Cartridge Metal.

Sample No.	Tensile Strength, Lb. Per Sq. In.	Elongation in 4 In., Per Cent.
1 (One pass)	79,130	5.0
	79,760	4.25
	77,770	5.0
Average	78,890	4.75
2 (Six passes)	77,420	4.75
	77,870	5.25
	78,340	4.75
Average	77,880	4.92

As a further check on this experiment a sample of high brass rod containing a small percentage of lead was drawn to ½ in., carefully annealed and treated precisely as in the above outlined case, except that a reduction of 50 per cent was effected in one sample by one draft through a die, while a similar reduction was effected on the other rod by five successive passes.

The results of physical tests are shown in Table II, while Figs. 3, 4, 5, 6, 7 and 8 show the results of the microscopic examination. Figs. 5 and 8 were taken from the exact center of the two rods and show no difference whatsoever.

It is at least certain that nothing in these observations indicates that any superiority is possessed by the samples from material reduced in several passes over that reduced in one pass.

Upon examination of the ends of the rods after drawing it was found that those passing last through the die were cupped because of the greater flow of metal near the surface, and that the cup in the rod having five passes was much deeper than in the other case. It is this uneven flow which produces the internal strains which cause season cracking. It was therefore decided to investigate this phenomenon further. A rod of high brass, free from lead, was extruded and drawn to 1 15/16 in. diameter

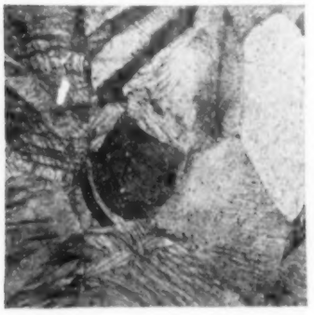


FIG. 1.—ROLLED SHEET NO. 1 (×75).

FIG. 2.—ROLLED SHEET NO. 2 (×75).

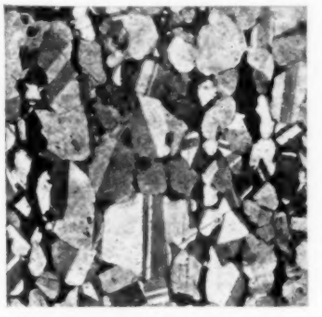


FIG. 3.—½-in. DIAMETER, ANNEALED.

and carefully annealed. One portion of it was drawn to 1.415 in. in diameter in one pass and an adjacent portion to the same diameter in five passes.

Prior to drawing, the ends of the rods were accurately squared up in the lathe.

Fig. 9 shows the appearance of the ends, the one drawn in one pass having the shallower cup. It is the intention to investigate the relative intensity of the internal strains in these two rods and report the results obtained later. A careful microscopic examination was made of each rod but no differences could be detected.

TABLE II.—TESTS OF DRAWN BRASS ROD.

Sample No.	Tensile Sstrength, Lb. Per Sq. In.	Elongation in 4 In., Per Cent.
1 (One pass)	94,450	4.25
	94,300	4.25
Average	94,380	4.25
2 (Five passes)	93,700	4.25
	93,450	4.25
Average	93,580	4.25

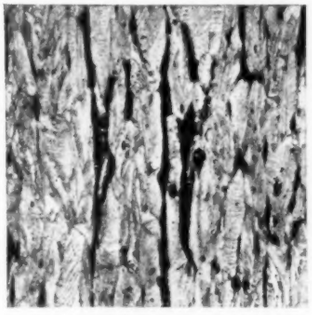


FIG. 4. 0.350-in. DIAMETER, EDGE.

FIG. 5. 0.350-in. DIAMETER, CENTER. ROD NO. 1.—ONE PASS (×75).

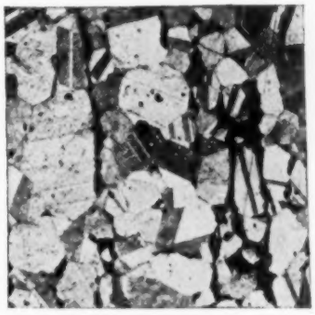


FIG. 6.—½-in. DIAMETER, ANNEALED.

FIG. 7.—0.350-in. DIAMETER, EDGE.

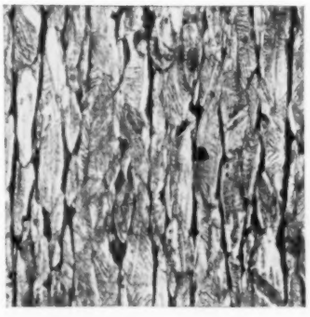


FIG. 8.—0.350-in. DIAMETER, CENTER. ROD NO. 2.—FIVE PASSES (×75).

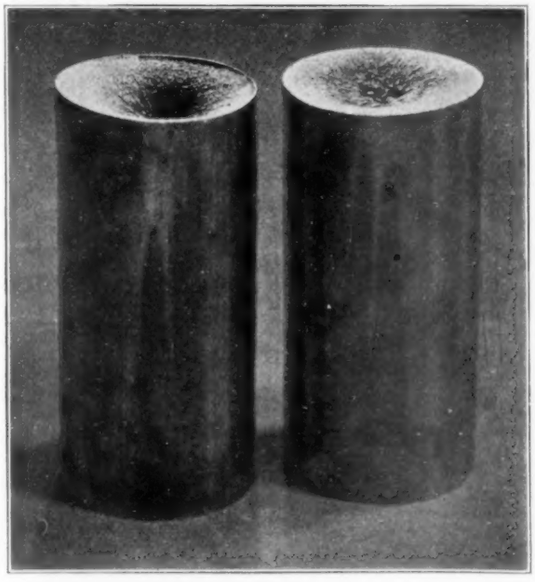


FIG. 9. ROD NO. 1 ONE PASS. ROD NO. 2 FIVE PASSES.

While these experiments cannot be considered as conclusively demonstrating the falsity of the statement quoted at the opening of this paper, at the same time they are better evidence than any evidence that has been presented in support of its truth. It is therefore felt that it is not yet necessary to abandon the existing methods of working brass in favor of that recommended by Professor White.

INTERIOR SURFACE DEFECTS ON BRASS CONDENSER TUBES AS A CAUSE OF CORROSION.

It is a common experience to find clauses in specifications which have been adopted by the writer thereof because the requirements which they demand appear to be reasonable but which have, as a matter of fact, no basis either in theory or experience.

Certain users of brass condenser tubes have been impressed with the belief that interior surface defects operate to produce corrosion which exhibits itself in the formation of local pitting, terminating in perforation. The writer at one time held this belief and took occasion to make a careful examination of every case of corrosion of this character which came under his notice, with a view of observing whether there was any evidence in support of it. No case, however, has ever been found by him which would support any such view. It has not been found possible to show that tubes which contained such interior surface defects were any more subject to corrosion than those which were free from them.

It has further been observed that there is no tendency whatever for areas of corrosion to localize in the vicinity of such defects. Moreover, many cases have been found in which severe pitting had occurred in the vicinity of such defects, but absolutely no tendency of the corroded areas to follow along the lines of defect has ever been noticed.

A recent case of severe corrosion was observed which furnishes very strong evidence that no such connection exists. The tubes had been in service in the condenser

of a large stationary plant for a period of six months, and were removed because of perforations caused by local corrosion on their interior surfaces. Of a lot of eleven tubes, eight were found to be absolutely free from surface defects in the vicinity of the corroded areas, while three samples were found to contain such defects. These tubes were sawed longitudinally and opened out flat so as to show the interior surfaces. Three characteristic samples from the unblemished tubes were taken and photographed for comparison with three containing surface defects, the photographs being reproduced herewith, magnified.[1] These photographs show very clearly the surface defects and the location of the corroded areas with respect to them.

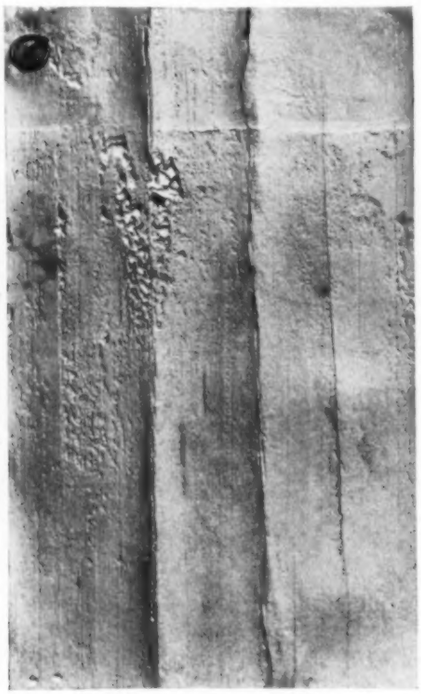


FIG. 1. CORROSION ON TUBE CONTAINING INTERIOR SURFACE DEFECTS.

FIG. 2. CORROSION ON TUBE CONTAINING INTERIOR SURFACE DEFECTS.

FIG. 3. CORROSION ON TUBE CONTAINING INTERIOR SURFACE DEFECTS.

FIG. 4. CORROSION ON TUBE FREE FROM INTERIOR SURFACE DEFECTS.

[1] In preparing these photographs for publication, it was necessary to show them at a slightly reduced size. Figs. 1 to 6 are approximately eight-tenths the size of the tubes.—Ed.

Particular attention is called to the fact that even where a corroded area crosses a defect, no tendency whatever for the corrosion to follow the defect is observable. In most of the samples the corroded area was confined to

FIG. 5. CORROSION ON TUBE FREE FROM INTERIOR SURFACE DEFECTS.

a distance not over 4 in. from the inlet end of the tube; the remainder of the tube being as free therefrom as when first made. In one or two cases the corroded area was

FIG. 6. CORROSION ON TUBE FREE FROM INTERIOR SURFACE DEFECTS.

similarly confined to a short distance in the length of the tube, but was some distance from the end thereof. Figs. 1, 2 and 3 show the tubes containing interior defects, and Figs. 4, 5 and 6 show the tubes which are free from them.

The effect which temperature has upon corrosion is very well shown by the fact that the corroded area in most cases stops quite abruptly on reaching that portion of the tube which is in contact with the tube sheet. There would be naturally a very considerable difference in temperature between the portion of the tube which was in contact with the tube sheet, and that which was in contact with the steam.

It is not intended that the evidence herewith presented should be considered as arguing in favor of the presence of defects of this character. It is, however, a fact that evidence of their existence can be largely removed by treatment which detracts from the resistance of the tube to corrosion, while on the other hand they are rendered more highly visible by treatment which tends very materially to increase this resistance.

As a consequence, tubes treated in a manner tending to decrease their serviceability will frequently be accepted under specifications containing restrictions of the character in question, but would be rejected when made in accordance with methods calculated to give them the maximum endurance.

It, therefore, follows that a rigidly interpreted clause of this nature may operate to weaken rather than strengthen the specifications of which it is a part.

CHROMIUM, COPPER AND NICKEL ALLOYS.

"A Preliminary Study of the Alloys of Chromium, Copper and Nickel," by D. F. McFarland and O. E. Harder has been issued as Bulletin No. 93 by engineering experiment station of the University of Illinois, Urbana, Ill. The purpose of the investigation is stated as follows:

"The growing interest in special acid-resisting alloys and the many uses found for them have stimulated both the search for efficient materials of this nature and the study of the causes underlying their inertness. The alloys developed by Prof. S. W. Parr for use in calorimeter construction have shown this quality of high resistance to corrosion to a marked degree. The almost perfect insolubility of these alloys in nitric and other acids seems to be conditioned upon a proper mixture of chromium, copper and nickel, together with smaller quantities of such added metals as tungsten or molybdenum. These additions have so marked an effect in improving both the acid-resisting properties and the casting qualities of the alloys that it has seemed desirable to study their effects more systematically in order that they may be used to the best advantage. The complexity of the mixtures used, however, has made the problem a very difficult one and has shown the necessity of first obtaining a more complete knowledge of the ternary alloys of chromium, copper and nickel, and of the binary alloys of copper and nickel, copper and chromium, and chromium and nickel. With this information in hand it should be possible to understand better the effects produced by additions of a fourth metal."

The bulletin is profusely illustrated with photomicrographs of the alloys described.

CORROSION OF TINNED SHEET COPPER.

Technologic Paper No. 90, describing an investigation by the United States Bureau of Standards, may be procured from the Superintendent of Documents, Washington, D. C., at 5 cents per copy.

ELECTRO-PLATING GENERATORS

An Address Delivered Before the Annual Convention of the American Electro-Plating Association at St. Louis, Mo., July 5-7, 1917.

By Floyd S. Taylor.*

The aim of this paper is to collect, arrange and present a few facts regarding electro-plating generators, with the hope that these facts may be interesting and useful.

It is evident that in the past too little attention has been given to the generator equipment of an average plating room. Almost any sort of a machine that would run without too much fireworks and flying copper dust was considered good enough, especially if it was cheap to buy, and as a result most of the designs have been crude, clumsy, inefficient and far behind the average of electrical equipment. The construction of a generator in general is so well known that no detailed description of the materials used in its principal parts seems necessary.

ELECTRIC PRINCIPLES.

It is important, however, to have a clear understanding of the principles on which a generator operates to transform the mechanical energy supplied to its armature shaft into electrical energy at its terminals.

The time honored illustration of a reservoir of water, a pipe line running down hill with various taps taken from it, and a pump to maintain a constant level of water in the reservoir, still seems to be the simplest and clearest picture of the operation of a direct current electrical system. The height of water above the center of the pump determines the pressure of water and is similar to the voltage at the terminals of the generator. The amount of water which flows whenever any faucet is opened corresponds to the current which flows when work is put into plating tanks, and the friction in the pipe line or in the faucet represents the electrical resistance.

In connection with this picture one or two points should be especially noticed. For example, the power in a hydraulic system depends on the product of the pressure, or head as it is called, and the volume of water flowing. In plating the electrical energy available for transformation into electro-chemical energy is the product of the pressure in volts and the current in amperes. Now in a water system the quantity of water which will flow through any faucet depends on the pressure and the friction of the system. In an electrical system the amount of current which will flow when a circuit is completed, depends on the voltage and resistance. In a plating circuit the resistance of the metallic part of the circuit is a fixed quantity, once the lead wires have been connected to anode and cathode rods. The resistance on the anode hooks may vary, and the effective resistance of the solution itself does vary with the area of work in the plating tank, the conductivity of the solution, the average distance between the anodes and the work and the conductivity of the work itself. The amount of current which actually flows determines the quantity of metal plated, but the efficiency of the system depends on the ratio of the chemical energy obtained to the electrical energy required.

Now the relations between voltage or pressure, current or quantity, and resistance or friction in a direct current system is known as Ohm's Law and should be understood by all those who have anything to do with electrical apparatus. Mathematically it is written $I = \frac{E}{R}$ where I is the current, E the voltage and R the resistance of the path. On a unity basis, therefore, one ampere will flow continuously through any circuit having a resistance of one ohm if one volt difference of electrical pressure is maintained continuously across the resistance itself.

This formula also shows that the current which flows varies directly and exactly with the variation of voltage. The importance of a constant and unvarying voltage in plating work is obvious, because with a constantly maintained voltage the amount of current flowing in one tank is entirely independent of the amount of work in any other tank. Consider our water pipe picture. Suppose the pressure of water in a building was appreciably different on the different floors, and furthermore, suppose it changed materially with the opening or closing of faucets. Under such circumstances we would have no control of the water. Just so in plating, without a constant voltage, regardless of the changes of load on the generator, the plating cannot be definite. For example, it may be impossible to maintain color in brass plating, texture in cold galvanizing, and troubles due solely to the generator may be sought in the solutions which are complicated, and where in an attempt to correct the supposed difficulty far worse ones may be set up.

As stated, the energy is the product of the voltage and current, or as we say, E x I = Watts, and this term is used for the power input of a motor, the power output of a generator, the losses of a motor or generator and the energy lost when current flows through a resistance. From Ohm's Law as E equals I x R, Watts can be expressed by the formula I^2R and this is worthy of your attention because it proves that in any circuit the loss is the resistance of the circuit multiplied by the current, and this product multiplied by the same current again. Where large currents are flowing a small resistance may mean a large loss, and this fact is commonly forgotten in the design of plating generators and particularly bus bar systems in plating rooms.

TYPES OF GENERATORS.

The principal types of generators are named after their field windings and are three in number—the shunt generator, the simplest and having only one set of field windings; the compound wound generator, having both a shunt and series field winding—that is, twice as complicated as the shunt type as regards field coils—and the interpole generator, which is either a shunt or compound wound generator with the addition of an entirely independent set of poles and coils. Interpole generators are usually compound to start with, the interpole windings must of necessity be in series with the armature current and therefore they are, of course, the most complicated of all generators.

Next, what are the reasons for one type or the other, and why not use the simplest type in all cases? As long as the work in the tanks remains constant, the voltage of a shunt machine, once set by means of the field regulator or rheostat, holds steadily if the driving power is sufficient and continuous. If the load is increased, however, the voltage drops, and if the load is lessened the voltage goes up, so that changing work in one tank disturbs all the tanks connected across the bus bars of a shunt generator. The disturbance may or may not be serious; former conditions can probably be restored by using either the generator field rheostat or tank rheostats

* Western Manager, Munning-Loeb Company, Chicago, Ill.

or both. The only way of avoiding this fluctuation of voltage is by using some sort of automatic voltage regulator which acts to weaken or strengthen the total value of the magnetic field as required by the changes in load.

The usual way of providing this automatic regulation of the field strength is to provide a separate set of coils on the field poles, which are connected in series with the armature and hence provide more or less magnetizing force as the load goes up or down on the machine.

The interpole winding is added to a generator for an entirely different purpose, namely to better the commutation of machines, which without such windings might be so poor in electrical design that they would not operate without serious sparking. Briefly, the principal point is this—in any generator the main magnetizing field, furnished either by the shunt field coils or by the shunt and series field coils, is called on to do three things: first, to provide sufficient magnetic flux or force to furnish the voltage required of the generator; second, to overcome the weakening effect on itself of the bucking field set up by the current in the armature coils; and third, to resist the cross magnetizing effect of the opposing field set up by the armature, which if not sufficiently offset would distort the direction of the resultant field so as to make it necessary to shift the brushes of the generator with changes of load to keep down sparking. At a very early date a number of inventors conceived the idea of opposing, in the most direct fashion, this cross magnetizing effect of the armature reaction as it is called and thus the interpole had its birth. It was clumsy and expensive, however, and soon discarded as advance in the art of generator design made it unnecessary. The interpole was revived about a dozen years ago in connection with variable speed motors for machine tool drive and for high speed turbo generators, railway motors and the like, because it was discovered that, within certain limits, by adding, say one pound of material in the form of an interpole and its winding, two pounds of material could be saved elsewhere in the machine. Whether the shunt, compound, or interpole design is the best for plating work, that is, whether the simple is sufficient or the complicated with its inherent drawbacks is required, is a matter of opinion, and this paper is to deal with facts only.

Generators are either self excited or separately excited. Separate excitation means steadier operation, and when a direct current shop line is available it is the thing to use. On the smaller machines without a source of direct current supply the extra complication and the extra cost of the exciter is usually not justified. Separate excitation is, of course, useful in another way, namely as a tonic or steadier of weak designs.

If a machine is to operate much of the time appreciably below its rated voltage, for example a six volt machine running at four volts, the best way of obtaining the lower voltage is by lowering the speed, because a generator is always steadier when its fields are maintained at their full strength. This method is only available with belt driven generators where a cone or step pulley countershaft can be used, and in the case of a motor generator set where an adjustable speed direct current motor can be used for driving the generator. Where so great a variation of voltage as this must be obtained by varying the generator field and not its speed, separate excitation should certainly be used.

RATING OF GENERATORS.

The rating of generators is a subject which has been misunderstood because what is usually regarded as the rating is strictly speaking only the name plate marking.

The real rating of any piece of electrical apparatus, designed to convert mechanical energy into electrical energy or to transform electrical energy from one form to another, or even to convey electrical energy, is determined by the ability or capacity of the apparatus to get rid of the heat of its own losses and therefore is fixed by temperature limits beyond which the insulating materials used rapidly break down. A generator must be designed to commutate its current up to the load limit set by the allowable temperature rise.

For a continuous duty machine, in which class plating generators fall, the standard heating limits measured by thermometer are as follows: First, after the generator has been run at its full load current and voltage continuously until its temperature has become constant, no part of the machine, except the commutator, must show a temperature rise of more than 40° Centigrade above the temperature of the surrounding air. The allowable rise on the commutator is 45° Centigrade Furthermore, immediately after such a heat run the generator must be able to carry 25% overload for 2 hours continuously with a temperature rise not exceeding 55° Centigrade in any part except the commutator, which is allowed 60° Centigrade rise maximum. The maximum overload operating requirement is that the generator shall be able to carry 50% overload current at full voltage, momentarily, and immediately after the heating tests, without injurious sparking at the brushes. The commutation at any load up to 25% overload must be sufficiently good to permit of continuous operation without adjustment of the brushes.

The rating usually understood as describing the generator is its name plate marking. This should show the kilowatts output, the full load voltage, and the full load current, as well as the rated speed, maker's name, character of winding and serial number or other means of identification.

It is important to know the full load voltage and the full load current, as well as the watt or kilowatt rating, because while plating is done by the current only, voltage is required to drive the current through the conductors and solutions, and as previously stated, the product of these two factors determines the electrical energy available for transformation into the chemical energy of plating. Thus a 500 ampere generator at 5 volts will do only 5/6ths of the work of a 500 ampere machine which will maintain 6 volts.

Six volts seem to be the standard 2 wire voltage; 6-12 volts the standard three wire voltage. One reason for these standards is that these voltages are neither too high nor too low for the largest possible number of combinations of plating room voltages and circuits; another lies at the basis of the design of a multiple circuit one turn armature, and as this latter point is difficult to explain to those who are not familiar with the details of generator design, no explanation of this fact will be attempted in this paper.

Odd voltage ratings, like odd speed ratings, seem to have very little excuse for existence.

MATERIALS OF CONSTRUCTION.

The materials used in a plating generator are important, and therefore a brief description of those used in the principal parts may not be out of place.

Starting with the armature shaft which is made of steel, bear in mind that a plating dynamo runs continuously, as a rule 8, 10, 12 or 24 hours a day. It should therefore have a shaft, not a pipe stem.

Bearings should be bronze, although good babbitt bearings are satisfactory if they are watched. Good oiling devices, large oil wells, and oil deflectors on the shaft, which throw the creepage oil back into the oil wells and not out into the windings, are important points.

The armature punchings should be thin electrical sheet steel, heat treated. The armature coils are bar wound and carefully insulated with varnished cambric and cot-

ton tape. After assembly the whole armature should be immersed in hot insulating japan and baked.

The commutator is the most important part of the generator from an electrical standpoint and the most difficult part to construct from a mechanical standpoint. It consists of a suitable number of elongated keystone shaped copper bars insulated from each other and their means of support by mica. Many materials have been tried for insulating commutators; we believe that it is now accepted as a fact that mica is the best substance known for this work. The mica used between the segments must be of good quality and soft so it will wear down evenly with the copper. Three kinds of copper are used for commutator bars—cast, hard drawn or drop forged, and the so-called extruded metal. Cast segments are cheap but soft and usually full of small flaws. Hard drawn are much harder and more even in texture, while the extruded bars are the best of all. The clamping of the bars in the end rings is important because with heating and cooling, as the expansion and contraction of the commutator copper is different from the steel clamping devices, unless special means are provided to take care of this fact, the copper bars may be strained when hot, and therefore loosen up when cooled down, running the commutator unless it is retightened and turned off. The armature leads are soldered directly to the commutator bars or to lugs extending from them.

BRUSHES AND BRUSH HOLDERS.

Next we come to the brushes, and obviously these are important. Several kinds are used, namely, copper leaf, copper or brass gauze, loaded gauze, carbon, graphite and metal graphite. Copper leaf brushes are clumsy and unless kept in prime condition cause so many troubles, both electrical and mechanical, that they have been discarded by most of the modern designers. Brass or copper gauze are better, but they have the faults in a less degree of the copper leaf brush, and the same can be said of the loaded brush. Carbon brushes are weak for plating generator work in that they have a high electrical resistance and a high co-efficient of friction. Graphite brushes have a high electrical resistance and are brittle, but they have a low co-efficient of friction. The metal graphite brush is a mixture of copper, graphite and carbon, and if of proper quality it combines the good features of the copper leaf, the carbon and the graphite brush. This type of brush seems to be rapidly superseding all others.

Of no less importance than the brushes themselves are the brush holders. These are of three general classes, first the rigid arm type, second the box type, and third the reaction type. The rigid arm type is rarely used now, as it is clumsy and as its name implies, rigid in its action, whereas it should be flexible. The box type, where the brush is fed down on to the commutator through a four sided guide, is a good type if the spring arm which holds the brush down is correctly designed and the box guide smooth and nicely fitting so the brush cannot stick in its guide. With this type of holder it is important to keep the pig tails on the brushes properly connected to both the brush and the holder so the brush does not transmit its current to the box guide and weld itself fast and to keep the guides and brushes clean. But the real point, little understood and seldom appreciated, is that the brush and the spring member which holds it on the commutator is really a pendulum, and that the brush will not follow the ups and downs of the commutator unless it can move instantly, which a pendulum of any length cannot do. The reaction type, brought out years ago by Bayliss, is really a box type without the objectionable features of the guides around the brush and with the pendulum effect reduced to a minimum. In place of the guide, the reaction type holder makes use of the reaction of the commutator against the downward spring pressure on the brush, each acting at a different angle, to hold the brush securely but lightly against a flat inclined plate. The brush is, therefore, as free as possible to follow the commutator, and yet it is fed down at exactly the proper angle and alignment.

The pole pieces may be of cast steel or laminated punchings. The choice is more one of manufacturing preference than electrical excellence, although there may be a slight advantage in favor of laminated poles. So-called cast in poles are a makeshift.

The yoke or frame is usually of cast steel on account of the fact that a steel frame machine can be made smaller and somewhat more efficient.

The terminals should be well insulated from the frame, and are fitted for round wires on the small machines, and for either round or flat bus bars on the large machines. Flat bus bars are really better than round bars, on account of the greater cooling effect.

So much for the materials used.

DRIVING MOTORS.

In the modern plating room the motor generator set has become so usual that a few words on the subject of driving motors will not be out of place in this paper.

Shunt motors are used on direct current circuits and squirrel cage motors on alternating because these are the simplest and cheapest types of motors and they run at nearly a constant speed, regardless of the load. It is important to see that a motor of sufficient capacity is furnished to drive the generator when fully loaded, otherwise many troubles ensue. The materials and features noted in connection with plating generators are also required for good motors, in fact, to be more accurate, we ought to say that good motor construction and design should be used for plating generators. For starting motor generators it is customary to use simple hand starting boxes for the direct current motors and hand starting compensators for the alternating current motors.

EFFICIENCY OF A GENERATOR.

Let us consider now the question of electrical efficiency, first by pointing out the separate losses, second by showing how the various losses can be altered, and third what efficiency mean in dollars and cents to the user of an electro plating dynamo.

The efficiency of any machine is the ratio of what you get out of it to what you have to put into it for the output demanded. Now as you get out of any machine all that is put into it and not lost in one way or an other, it is evident that the losses of any generator determine its efficiency. As a matter of fact the proper way to determine the efficiency of a dynamo or motor is to measure the power input and the losses, not the total input and the total output.

The losses of a motor or dynamo are divided into two classes, mechanical and electrical.

The mechanical losses are as follows:

- Bearing friction.
- Windage or air friction caused by the moving armature.
- Brush friction.

The electrical losses are as follows:

- Copper losses of the armature windings.
- Iron losses of the armature punchings.
- Copper losses of the shunt field and field rheostat.
- Copper losses of the series fields.
- Copper losses of the interpole fields, if the machine has interpoles, and

Copper losses of the brushes and brush contacts.

The copper losses of the leads from the brush holders to the terminals of the machine, although they may be of moment in a plating dynamo, are usually lumped in with the series field losses.

Let us see what these losses amount to in an actual machine, taking a 5,000 ampere 6 volt compound wound self excited generator as our example. In the machine in question the separate losses are as follows:

Bearing friction and windage	450	watts
Brush friction	2,700	"
Total mechanical losses	3,150	"
Armature copper losses	1,350	"
Armature iron losses	800	"
Shunt field and rheostat losses	450	"
Series field losses	400	"
Brush current losses	2,850	"
Total electrical losses	5,850	"
Adding mechanical losses	3,150	"
We have total losses	9,000	"

Now the output is 5,000 amperes times 6 volts, or 30,000 watts; therefore the input must be 39,000 watts and the efficiency is therefore $\frac{30,000}{39,000} = 76.9\%$. The total losses, therefore, are 23.1% and they are distributed as follows:

Bearing friction and windage	1.17%
Brush friction	6.92%
Total mechanical	8.09%
Armature copper	3.46%
Armature iron	2.05%
Shunt field and rheostat	1.17%
Series field	1.02%
Brushes	7.31%
Total electrical	15.01%
Adding mechanical	8.09%
Total losses as stated	23.10%

The machine in question is not fitted with interpoles; if such had been the case the interpole field losses would have been equal at least to the series field losses, and the series field losses themselves would probably have been somewhat larger.

How can these losses be changed?

The bearing friction and the windage losses can be changed by changing the speed of the machine; other changes which might reduce these losses are usually impractical.

The brush friction losses can be changed by changing the speed of the machine, by changing the diameter of the commutator, by changing the number or kind of brushes.

It should be noted that the friction losses affect the efficiency of the generator by 8.09% in the slow speed machine under discussion and that these losses go up as the speed of the machine is increased; for example, if the speed of the machine were to be doubled, the bearing friction and the brush friction would double, but the windage losses would more than double. To keep down the friction losses, therefore, as well as to keep down the wear and tear on the generator, keep the speed low.

The armature copper losses can be reduced by using bigger copper bars for the windings or by reducing the diameter of the armature. To do the former usually requires an increase in the armature diameter; to do the latter means smaller conductors. Good designs, therefore, balance one factor against the other, and in fact good design means the proper or best general balance between all the conflicting elements of design. It is a lack of such symmetry which marks so many plating generators to the trained eye.

The iron losses can only be reduced by using a better grade of iron or steel; changing the magnetic density would only lead to other troubles.

The shunt field losses can be reduced by using more copper on the fields, or else by reducing the air gap of the generator. The latter is, of course, the popular way of reducing the copper loss of the shunt fields, but unfortunately, it ruins the operation of the generator.

The series field losses can be reduced by using larger conductors, or by using a smaller perecentage of compounding. The loss stated for the series fields—namely 400 watts—serves to illustrate very clearly the effect of joints in an electrical circuit carrying a large current. For example: if the total loss in these fields is 400 watts, when the machine is delivering 5,000 amperes, the total resistance of the twelve series coils, and twelve electrical joints in this part of the circuit, is .00001 ohms. Without trying to give you a picture of what such a small resistance means, it is easy to understand that such a value is very small, and that a single bad joint in the circuit might greatly multiply such a resistance; and also that the loss, which is a direct function of the resistance, would of course be multiplied by the safe factor. Such losses are very subtle, hardly ever suspected, but usually present.

The brush current losses can be lowered by increasing the number of brushes; sometimes by changing the quality of the brushes. To increase the number of brushes increases the brush friction losses; to change the quality, in an effort to improve the electrical characteristics, may do likewise. Therefore, in a well designed machine, the speed, the diameter of the commutator, the number and character of the brushes, and the design of the brush holders, are factors that are studied with great care, since the sum of the brush losses is greater than the sum of all the other losses. Maximum brush economy is attained when the brush friction losses are exactly equal to the brush electrical losses.

So much for the efficiency of a generator.

EFFICIENCY OF A MOTOR.

The efficiency of a motor generator set is the product of the efficiency of the driving motor, and the efficiency of the driven generator. This is obvious from the following illustration: Suppose we couple together a motor having an efficiency of 90%, and a generator having an efficiency of, say for round figures, 70%. The efficiency of such a motor generator set will be 63%, because the motor will deliver to the generator 90% of the power put into it, and the generator, in turn, will deliver to its bus bars 70% of the power delivered to it by the motor; hence, 70% of 90% of the power taken from the mains by the motor; consequently, the efficiency of the set is, as stated, 63%.

When a separately excited generator is used, the efficiency of the excitor must be taken into account in figuring the overall electrical efficiency of the system; as the losses in the excitor, watt for watt, are just as expensive to the user as the losses of the main generator or the driving motor.

Next we come to a consideration of the dollar value of efficiency; that is: what is the difference in cost of operat-

ing two generators or motor generators of different efficiencies?

Let us assume that our cost for power is 5 cents per kilowatt hour; that our plant runs 9 hours per day, 300 days per year. Then for every kilowatt of power used, the yearly cost will be \$.05 x 9 x 300 or \$135.00. A higher or lower power rate, a longer or shorter working year, will, of course, affect this figure in direct proportion.

Suppose for a moment we consider a 30 kilowatt generator with an efficiency of 100%, the annual cost for

$$\text{power would be } \frac{30 \text{ KW} \times \$135.00}{100\%} \text{ equals } \$4{,}050.00 \text{ at}$$

full load, and this is, of course, a minimum figure never possible of attainment in practice.

Now let us take the generator which we have discussed with its efficiency of 76.9% and direct connect it to a 50 HP motor, having an efficiency of 90.6%, thus obtaining a motor generator set with an overall efficiency of 69.7%. Under such conditions the annual cost for power must be

$$\frac{\$4{,}050.00}{69.7\%} \text{ equals } \$5{,}810.00.$$

Suppose we consider a second set of the same capacity and that its overall efficiency is only 1% lower than the first, on the same basis the annual cost for power to drive

$$\text{this second set will be } \frac{\$4{,}050.00}{68.7\%} \text{ equals } \$5{,}895.00. \text{ The}$$

first set, therefore, with a gain of only 1% in efficiency, shows an annual saving of \$85.00 net. Now in considering two sets of fairly similar construction, speed and output it can be assumed that the depreciation of one is practically equal to that of the other, and therefore this net saving of \$85.00 per year shows the true difference in value of these motor generator sets to the user if it is capitalized at 6%. This means that the set with the higher efficiency is worth \$1,417.00 more in first cost than the one with the lower efficiency.

We have considered these sets as operating at full load continuously, which is just as fair for one set as for the other. Bear in mind that a plating generator having an advantage of 1% in efficiency at full load will probably have an even greater perecentage advantage at fractional loads.

CONCLUSIONS.

Finally, to sum up, let us state the principal points to be considered in the selection of a plating generator. They are first, efficiency, because, aside from the gain in operating cost as just outlined, an efficient generator is always satisfactory from an operating and upkeep standpoint.

Second, regulation, that is, the ability of the machine to hold its voltage constant regardless of variations of the load, sudden or otherwise.

Third, magnetic and electrical balance or symmetry, preventing cross currents, for example, between the two ends of a double commutator machine and pulsating currents within the armature.

Fourth, simplicity, that is, the elimination of unnecessary parts, winding, etc., making the machine easy of access, easy to understand and easy to clean and inspect. A simple machine has, of course, the smallest number of electrical joints and mechanical pieces.

Fifth, the commutator construction and materials, for reasons already pointed out.

Sixth, the brushes, not too big and not too many, and not of a type that requires frequent attention to keep them from wearing ridges in the commutator.

Seventh, the brush holders should be sturdy without many or clumsy parts, and self aligning.

Eighth, the insulation should not be of fibre designed for six volts, but of mica, porcelain, moulded materials, electrical varnishes, etc., to resist the moisture and fumes of plating rooms and to stand against external grounds.

THE MANUFACTURE OF BRONZE POWDER

AN ILLUSTRATED DESCRIPTION OF ITS PRODUCTION IN GERMANY AND ITS INDUSTRIAL USES.

WRITTEN FOR THE METAL INDUSTRY BY OTTO VON-SCHLENK.

(Concluded from May.)

The fine powder obtained from the raising machine is sufficiently fine for most requirements. About 90 per cent. of all powders used are obtained from the fine stamps without any further disintegrating process.

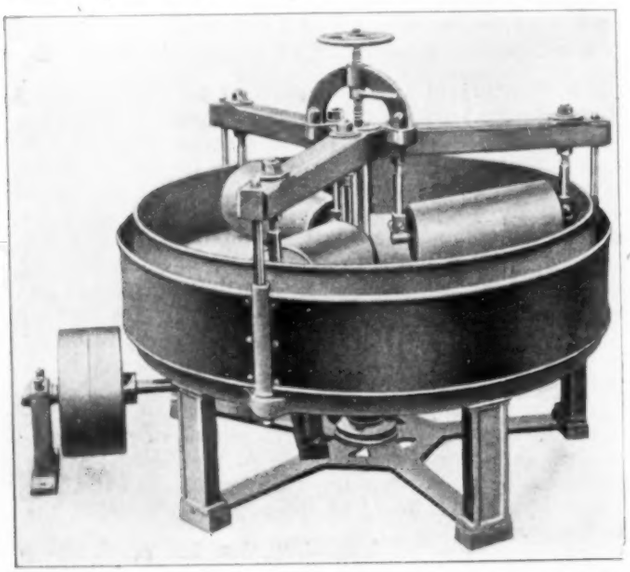


FIG. 13. GRINDING MACHINE FOR MAKING LITHOGRAPHIC POWDERS.

For some purposes, however, a powder is required which is still considerably finer. More especially the powders required for the best lithographic processes should be finer than that produced by the fine stamp. Powders for these purposes realize good prices and can only be produced by grinding. For this, the finest powder is added to a fairly thick solution of best gum arabic, which is put into the grinding machine as shown in Fig. 13. This is a positively geared edge-runner, with three cone-shaped grinding stones made of best granite. The action of the machine is perfectly automatic. The time required for the process is from four to six hours, according to the degree of fineness required.

The gum arabic has the effect of binding any impurities clinging to the powder. When the grinding process is completed, the gum is dissolved out from the bronze-powder solution by pouring it into vessels filled with fresh water. The powder has to be subjected to a further grading process. It is mixed with clean water (about 1 volume of powder to 3 volumes of water), poured into small, flat, conical vessels, a number of which are placed on a shaking frame. This frame is kept in a rocking motion for about half an hour, so that the powder is thoroughly mixed with the water, in which it is held in suspension. The machine is then stopped and the powder is precipitated in

the vessels. It is obvious that the coarsest powder will settle on the bottom, and the very finest powder on the top. When all the powder has settled down, the water is carefully removed by suction. The powder is now scraped off in several layers (generally 5-6), these consist of powders of different degrees of fineness. It is then spread on paper, and dried on specially constructed brick ovens at a temperature of 40° C.

POLISHING.

The fine powder coming either from the fine stamp or from the grinding machine has generally a somewhat dull appearance. The finer the powder is, the duller it appears in bulk. It has therefore to undergo the final process of polishing.

The polishing is done in horizontal polishing drums (See Fig. 14). These consist of a drum made of ribbed steel sheet, closed on either side by suitable end-pieces. The drum has two doors, which can be closed air-tight: one at the top for charging the polisher with powder; the other at the bottom for emptying the drum. A shaft runs right through the center of the drum, and stuffing-boxes are provided on either side. On the shaft are fixed three radial arms, and on these arms are arranged three very stiff brushes. If the drum is filled with powder, and the

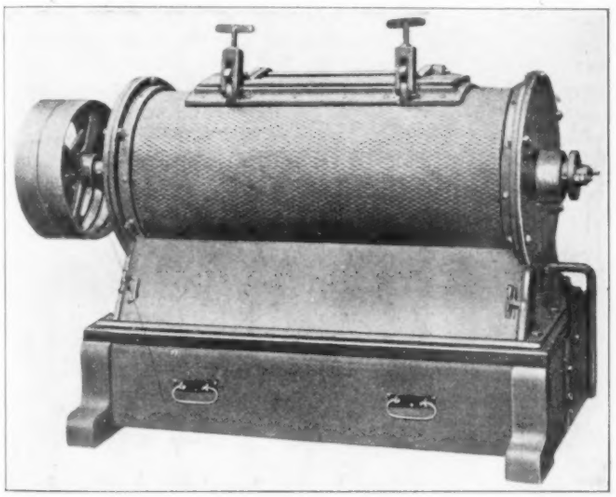


FIG. 14. HORIZONTAL POLISHING MACHINE FOR POWDER.

shaft driven at about 100 r.p.m., the powder is not only thrown continually against the ribbed interior of the drum, but a certain amount being always driven between the brush and the drum wall is thus exposed to the rubbing action of the bristles; in this way the surface of the small powder particles becomes highly polished.

According to the purpose for which the powder is to be used, the time of polishing must be varied. For lithographic powders, to about 20 lb. of powder a teaspoonful of olive oil is added, and the powder polished for about 12 hours. For paint powders, a quantity of stearine must be added, and the powder polished for 16-18 hours.

COLORING.

While about one-half of all bronze powders are sold in their natural colors, a large proportion are either colored by tempering, or dyed.

The natual colors are either silver—as in the case of aluminum-bronze and tin-bronze; or gold—as in the case of brass; and bronze. The natural color of these latter varies, of course, with the composition of the alloys used. In the following tables are given the composition of alloys suitable for the colors most frequently required.

If these alloys are treated carefully in the polishing machines they will always show the correct shades in the finished product.

Apart from these colors, about 60 more shades are on the market and are in constant demand. The more natural of these shades can be produced by tempering the bronze powders, while the more vivid shades can only be produced by dyeing either bronze or aluminum powders with aniline dyes.

To produce colors by tempering, the powder is put into flat copper pans, which are gently heated on special stoves (charcoal only being used as fuel). The powder is constantly stirred up, and as it becomes hot the various tempering colors appear. It is a matter of practice to stop the process at the right moment and to obtain a uniformly colored product. The addition of oil and vinegar, during the heating process, changes again the color, and in this way about 30 different shades can be produced, varying from green, blue, lilac, to carmine, red, and brown.

For dyeing bronze paints, all basic coal-tar dyes can be used, provided they are soluble in alcohol. Forty grs. commercial tannin are dissolved in 400 cubic cm. of 90-96 per cent. alcohol; into this solution is brought about 1 kg. of the powder and thoroughly mixed with it. The alcohol is then evaporated in a suitable closed vessel at a temperature of 30-40° C. When the powder is quite cooled down it is brought into a mixture of 40° of the dye in 400 cubic cm. alcohol (90-96 per cent.), and stirred thoroughly. Should the dye not be perfectly soluble, the dye-alcohol mixture must be filtered before it is used. If this is neglected, the dyeing would not be uniform, and the powder would become very dull. The mixture of powder, dye and alcohol must again be dried at a moderate temperature. Denatured spirit may be used. Lighter shades may be produced by reducing the quantity of dye from 40 gr. to 30, or even 20 gr. per kg. of bronze powder.

In dyeing bronze paints by means of aniline dyes it is necessary to distinguish between white and yellow paints. White paints consist generally of tin, with an addition of a small percentage of antimony. Yellow paints consist of alloys of copper and zinc. If white paints are dyed in the manner described, the product will show great durability; yellow paints are less durable.

In such cases it is desirable to add 20 gr. of acetate of potash to the tannin solution. In any case the dyed paints must be once more polished after they are dyed.

Commercial bronze powders can be dyed in a similar manner. To obtain, for instance, a blue powder, proceed as follows:

The powder is placed in a porcelain dish and covered with a solution of 15 gr. aniline-blue in 1½ litres of alcohol. The mixture is stirred until dry. This process must be repeated until the required shade is obtained. If sufficiently dark, the powder is washed in luke-warm water; before it is quite dry a little sperm-oil is added in the proportion of one spoonful of oil to one kg. powder, and thoroughly mixed with the powder.

Better results are obtained if, before dyeing it, the powder is brought into a 0.5 per cent. solution of alum and boiled for 2-3 hours. It must be washed before being brought into the dyeing solution.

I.—BRONZE ALLOYS (1ST SERIES).

	Copper.	Zinc.	Iron.
Rich gold	82.33	16.69	0.16
Light green	84.32	15.02	0.63
Citron	84.50	15.30	0.07
Red-copper	99.90	Traces.	Traces.
Orange	98.93	0.73	....
Pale gold	90.00	9.60	....
Carmoisin	98.22	0.50	0.30
English green	96.46	2.30 (Tin)	0.55

II.—Bronze, Alloys (2nd Series).

	Copper.	Zinc.	Iron.
Pale yellow	82.33	16.69	0.69
Bright yellow	84.50	15.30	0.07
Red-yellow	90.00	9.60	0.20
Orange	98.93	0.73	0.08
Copper	99.90	....	Traces.
Mauve	98.22	0.50	0.30
Green	84.32	15.02	0.03
White	96.46 (Tin)	2.39	0.56
White	96.46 (Tin)	0.56 (Iron)	2.39 (Zinc)

III.—English Bronzes.

	Copper.	Silver.	Tin.	Zinc.	Oil.
Copper	83.0	4.5	8.0	...	4.50
Light copper	64.8	4.3	8.7	12.9	3.0

Three very important colors are:

	Copper.	Zinc.
Pale yellow	85	15
Pale rich gold	75	25
Pale gold	70	30

ALUMINUM POWDER.

So far we have discussed the manufacture of powders from brass, bronze, copper, and tin only. The manufacture of aluminum powder, though essentially similar to that of other powders, differs inasmuch as special precautions have to be taken to avoid explosions.

It is well known that aluminum powder, when mixed

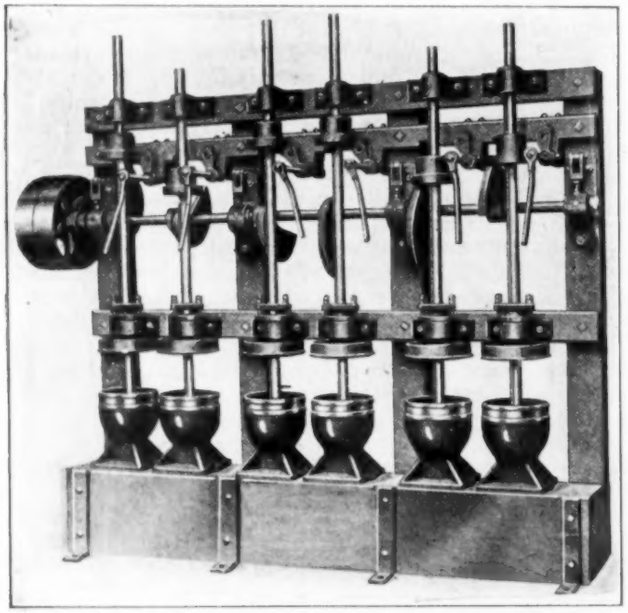


FIG. 15. STAMP FOR ROUGH STAMPING POWDER.

with a certain quantity of air, is a most powerful explosive. From the nature of the machines described, it is obvious that in all of them a mixture of air and aluminum powder does actually exist. Thus in the stamping machines described we have a space filled to one-third with metal powder, provided with a fan for stirring these powders and, in addition, the rammers, which by falling down produce a certain amount of heat. In ordinary circumstances this heat is not sufficient to set up an explosion. Secondary influences may, however, cause one. Thus, for instance, there may be smaller or larger particles of iron or steel present in the metal, and these may cause sparks. Or, due to dampness, the formation of hydrogen may be favored, and with it the formation of explosive gas, which, in turn, may cause an explosion.

Eventually it was recognized that in order to avoid explosions the following precautions must be taken:

(1) All machines for aluminum powder must be securely earthed. It was found that frictional electricity was in many cases the cause of ignition. The machines used for aluminum powder must, therefore, be made entirely of metal, and the base of the machines connected to an earthing plate by mean of stout copper wire. The earthing plate must be placed in damp soil.

(2) The stamping space in the stamps must be made as small as possible. Hence the rough and medium stamping machines already described are not suitable for aluminum, the stamping space being far too large. The fine stamp is, as already mentioned, suitable both for aluminum and other powders.

(3) The only possible sources of danger in a suitably designed modern plant are the raising and the polishing machines. If these are suitably designed the danger can be reduced to a minimum, but even then it is advisable to place these machines, which require but little attendance, in a separate building and interlock the driving motor so that the machines can only be started from the outside of the building. As there is practically no risk of explosions while the machines are at a standstill, the risks to attendants are thus practically eliminated.

Generally speaking, all the ordinary precautions, such as exclusion of smoking, striking matches, great cleanliness, removal of dust, will further reduce all possible dangers. It may be pointed out that no explosion whatever has occurred during the last eight years on the Continent, where the regulations issued by the special committees have been strictly enforced, and where only the most modern machines, such as described in this article, have been used. On the other hand, the writer is fully

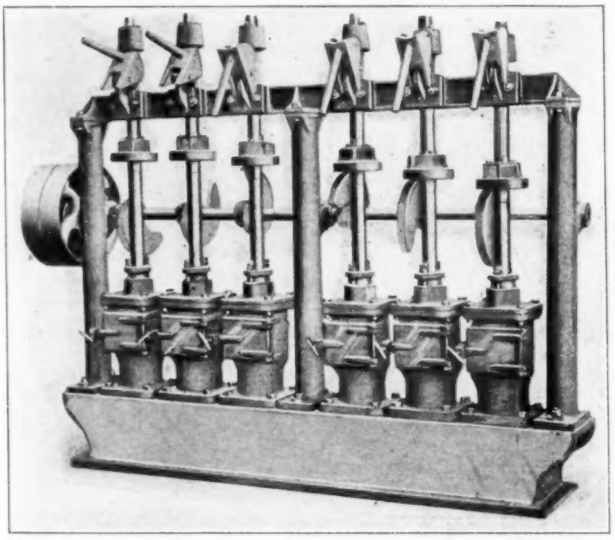


FIG. 16. MEDIUM STAMP FOR ALUMINUM POWDER

aware that even quite recently explosions have occurred in works, where either unsuitable machinery was installed, or where the regulations mentioned were ignored.

For rough stamping aluminum scrap a machine should be used as shown in Fig. 15. This consists of a powerful wooden frame, and six separate pots with rammers. Special leather sleeves (not shown in the illustration) are fitted over the pots and the discs above them to prevent an escape of material.

A medium stamp suitable for aluminum powder is shown in Fig. 16. The only difference between this and the rough stamp is that the pots are entirely enclosed, and that the ratio between drop and hammering surface is, of course, smaller.

DEVELOPMENT OF AN ALKALINE SUBSTITUTE FOR THE COPPER CYANIDE SOLUTION

RESULT OF AN INVESTIGATION INSPIRED BY THE HIGH PRICE OF CYANIDES.

WRITTEN FOR THE METAL INDUSTRY BY C. B. WILLMORE, ELECTRO-CHEMIST.

(Concluded from June)

MAINTENANCE CONDITIONS

With the straight tartrate solution, without any cyanide present, the current density at the cathode may be safely allowed to run as high as five amperes per square foot. This corresponds quite favorably to the amount of current ordinarily used in the copper cyanide bath. A pressure of about one and one-fourth volts only is needed to produce this current. Unlike the cyanide solution, no gassing should be apparent at the cathode during deposition. In this respect the solution is similar to the acid copper solution, which means that the current efficiency is 100%, actual tests often showing as high as 102%, because of the presence of cuprous salts. Raising the current density to the point where gassing occurs has a deleterious effect on both the solution and the deposit, particularly in the absence of any cyanide. It spoils the deposit by causing it to be spongy, or "burnt," and the formation of hydrogen seems to have a reducing action on the solution, forming cuprous salts, which results later in a precipitation of some of the copper as red cuprous oxide. With a small amount of cyanide present in the solution, the current density may be allowed to run much higher, as a moderate amount of gassing does not then seem to affect either the deposit or the solution. Two and one-quarter volts and a current density of ten amperes per square foot may then be used.

The solution should be kept at ordinary temperatures, that is, no attempt should be made to use it hot. Heating to nearly boiling causes it to decompose quite appreciably, and at the same time, appears to have no particularly beneficial effects, as regards anode corrosion or appearance of deposit.

The deposit obtained has a light pink color similar to that from the acid copper solution; but is of a somewhat finer texture. On a smooth foundation, the deposit is about as lustrous as that obtained from a copper cyanide solution with the addition of small amounts of hyposulphite of soda. The metal itself is of good quality so far as physical characteristics of strength and malleability are concerned.

Without the presence of cyanide in the solution, the deposit is very apt to stain soon after removal from the solution. This tendency is due to the high caustic soda content of the solution, a thin film of which, on the surface of the copper, and in contact with the air, has a quite active oxidizing effect. Here, again, the addition of a small amount of cyanide comes to the rescue and prevents oxidation before the deposit can be rinsed off. Even should this oxidation occur, it would not be objectionable in most cases, as the copper deposit is usually treated further. In any case, it can be removed altogether by dipping in a weak hydrochloric acid solution.

The articles to be plated must be fairly clean. Finger marks and small amounts of organic matter do not affect the adherence of the deposit, because the amount of caustic soda present is sufficient to saponify organic oils. However, mineral oils, and dirt are just as injurious as with any other plating solution. With a clean surface the deposit will adhere to any of the common metals except aluminium or zinc. With iron, it is best to dip the articles first into weak hydrochloric acid.

In some tests made as to the adhesive power of the deposit, highly polished sheet steel pieces were used. These were dipped into 10% hydrochloric acid, then rinsed off and plated for about forty minutes, obtaining a good heavy deposit. These pieces were then bent in two, and bent backward and forward a number of times until they broke. It was found that the pieces could invariably be broken in two without the deposit showing any signs of peeling.

Concerning the thickness of the deposit, pieces plated for twenty-five minutes at a pressure of one and one-fourth volts can be oxidized and spotted without cutting through the copper, this being from the solution not containing cyanide. With a little cyanide present, higher voltages can be used and the copper put on much faster.

One of the big questions concerning any solution is its maintenance. With this solution it is necessary to add, from time to time, a certain amount of caustic soda. This is because the carbon dioxide in the air reacts slowly with the caustic soda in the solution to form sodium carbonate. The presence of sodium carbonate is not harmful; but the loss of caustic soda occasioned by its formation must be made up. It will be found necessary to add about twenty-five or thirty pounds of caustic soda per week to a 300 gallon tank in order to keep it working properly. The plater can tell from the appearance of the anodes and the deposit when more caustic is needed. When it is in this condition, the anodes do not dissolve properly, and become coated with a green incrustation, while the deposit becomes darker. Too much caustic soda, on the other hand, has a tendency to cause the deposit to be iridiscent and easily stained, although the presence of cyanide prevents this effect to a marked extent. After long usage, the solution becomes so heavily loaded with sodium carbonate that this material begins to crystallize out and fall to the bottom of the tank. The solution should then be syphoned off every few months and the bottom material cleaned out.

If the temperature of the solution is allowed to become too high, or if the current density is so high as to cause excessive gassing, or if the anodes do not dissolve properly, the copper content may go down, and should be built up by the addition of freshly precipitated copper hydroxide, made by adding caustic soda to copper sulphate. A lack of copper will be indicated by the color of the solution, by gassing at the cathode, and by a thin deposit, burnt at the edges.

Another thing which causes copper to be thrown from the solution is the presence of certain organic matter, particularly such as may be decomposed into sugars by the action of the solution. Wooden tanks without linings have a marked effect in this direction. Such materials as glucose, dextrine, glue, molasses, etc., which are quite valuable addition agents for some solutions, very quickly precipitate copper from the tartrate solution.

A few addition agents were tried out with this solution. Hyposulphite of soda, which is a good brightener for copper cyanide solutions, causes the tartrate solution to deposit a very dark sponge. Carbonate of lead has practically the same effect, as does arsenic. Glycerine has no appreciable effect in either direction.

Ammonia, in moderate quantities has a partially beneficial effect, as it causes the anodes to dissolve better, brightens the deposit, and greatly improves the "throw-

ing" power of the solution. It has the disadvantage that it works out, and furthermore, if too much is added, it causes the deposit to be non-adherent to iron.

Sodium cyanide, to the extent of one-half to one ounce per gallon, has an extremely beneficial effect in many ways already mentioned. It gives a cleaner looking deposit, permits the use of higher current densities, keeps the anodes clean, and prevents the deposit from staining. In addition, it greatly improves the "throwing" power of the solution and increases the uniformity of the deposit. With the straight tartrate solution, the deposit on the inside of cavities is usually somewhat darker than on the outside. The cyanide clears this up. When using cyanide as an addition agent, in this way, it is not necessary to add large quantities from time to time, as is done with the cyanide solution: the cyanide does not work out with use, as it is the caustic soda which is used up instead. The small amount added will last for a very long time.

A comparison of the relative properties of cyanide copper and the tartrate bath may be profitable. The tartrate bath is not poisonous, and does not give off an offensive gas; hence it is much less injurious to the health of the operator. The deposit obtained from the tartrate bath is the equal of that obtained from the cyanide bath, and in addition can be produced more rapidly. The tartrate bath is a much better conductor; hence to obtain the same current density a much lower voltage is required. With the addition of a small amount of cyanide, the current density in the tartrate solution may be made higher than with the cyanide bath. Both solutions will produce an adherent deposit on iron and steel, but the tartrate bath does not produce an adherent deposit on zinc. The appearance of the deposits from the two solutions correspond quite closely. Without any cyanide present, there is a tendency for the deposit to stain; but the presence of a small amount of cyanide prevents this.

For maintenance, the cyanide bath requires the addition of sodium cyanide, of which there is a scarcity at present. The tartrate solution requires the addition of sodium hydroxide in somewhat larger quantity, which is relatively cheap as compared to cyanide, under all conditions of the market. Hence, the tartrate solution is considerably cheaper to maintain than the cyanide.

RE-FINISHING BRITANNIA WARE

SOME INSTRUCTION BEARING ON A PERPLEXING PROBLEM

WRITTEN FOR THE METAL INDUSTRY BY CHARLES H. PROCTOR

The greatest problem in connection with refinishing old and worn britannia metal articles that have been silver plated is to produce a chemically clean surface before re-silver plating and to accomplish this the following methods should be adhered to.

First—Immerse the articles in a hot cyanide dip to remove oxidation and this dip should be composed of 1 gallon of water and 8 ounces of sodium cyanide and heated to a temperature of 160 degrees Fahr. If any silver remains on the articles a moment or two immersion in the hot cyanide dip will bring up the white color of the silver. Afterwards wash thoroughly in water.

Second—If the articles are smooth and free from scratches and the old silver remaining upon the articles is adherent then cleanse by a soft bristle brush. This may be either of the hand brush variety or a revolving bristle brush, used in the same manner as a wire scratch brush. The cleansing medium should be floated whitening mixed to a paste with water and a little cyanide may be added to prevent the britannia surface from tarnishing. The articles should be brushed evenly all over and then rewashed in water.

Third—Immerse in a hot caustic soda solution for a moment or two then rewash thoroughly in water. The cleaning solution should consist of 1 gallon of water and 6 ounces of caustic soda at 200 degrees Fahr.

Fourth—From the cleaning and washing strike quickly in the silver strike solution consisting of the following:

Water	1 gallon
Sodium cyanide	6 ounces
Silver cyanide	½ ounce
Caustic soda	¼ ounce

Use a silver anode, temperature should be normal and voltage 3 to 4.

Fifth—After striking plate direct in the regular silver solution and a new solution should be prepared for this purpose and of the following materials:

Water	1 gallon
Sodium cyanide	5 ounces
Silver cyanide	3¾ ounces
Caustic soda	¼ ounce

Temperature normal, voltage 1 and anodes of fine silver. Plate the articles until sufficient silver is deposited. New articles have a certain amount of silver deposited and this is termed single, double, triple or quadruple plate. The triple plate would be equal to 1 ounce metallic silver per square foot of surface.

The old silver may be stripped from britannia by using a cyanide electro-strip.

Water	1 gallon
Sodium cyanide	8 ounces

The articles should be made the anodes, that is, the positive and for the negative or cathode the surface should be sheet steel. The strip solution should be arranged so that the work hangs between two sheets of steel so that in the stripping operations the silver is removed uniformly from the articles.

Quicking of britannia is frequently resorted to and this consists in coating the cleansed surface with mercury to produce a more adherent coating and a solution for this purpose consist of

Water	1 gallon
Sal ammoniac	1 pound
Bi chloride of mercury	2 ounces

Dissolve the mercury salt in a little boiling water then mix with the sal ammoniac. After quicking the articles should be washed in water then immersed in a cyanide dip to even up the surface and remove the grayish black stains from the mercury which sometimes develop in amalgamating britannia metal. Silver striking, and so forth, should be as above stated.

METAL EXPORTS FOR 1917.

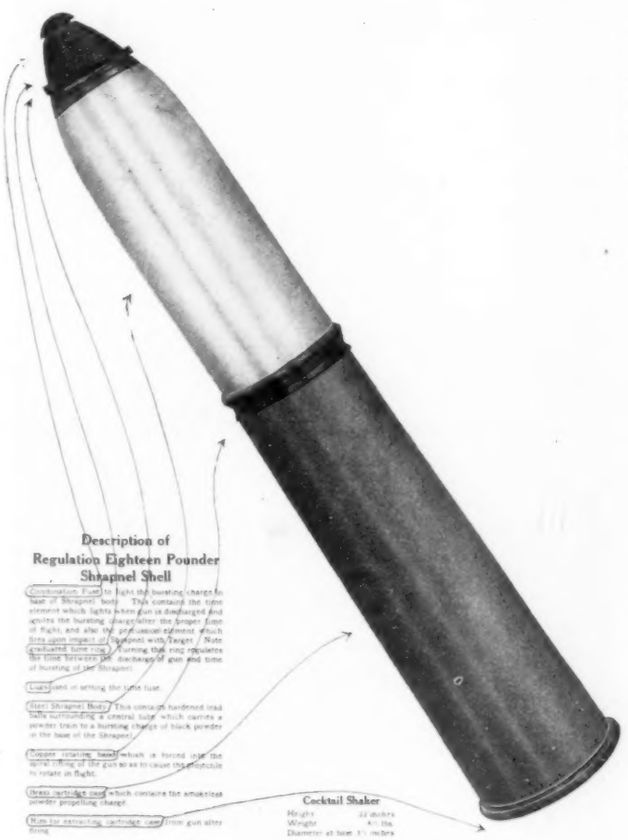
Export statistics issued by the United States Custom House have established a new maximum tonnage—180,726 tons—of copper, breaking all previous records not only for first quarter 1917, but for April as well. Estimating the May tonnage at 40,000 tons—slightly less than for preceding months—sustains the new average monthly record, to June 1. Exports of brass plates, rods and discs—⅔ copper in weight—were 56,665 tons.

MUNITIONS OF WAR

The Manufacture of Brass Cartridge Cases and Time Fuses Used on High Explosive and Shrapnel Shells.

Written for The Metal Industry by P. W. Blair, Mechanical Superintendent.

Too many of those looking forward to entering the field of manufacture in the production of brass component parts which enter into the construction of high explosive and shrapnel shells do not make careful enough considerations. One of the first elements that must be developed is the judicious heat treatment of brass, and the special alloy that enters into the manufacture of these



DETAILS OF AN EIGHTEEN-POUNDER SHRAPNEL SHELL.

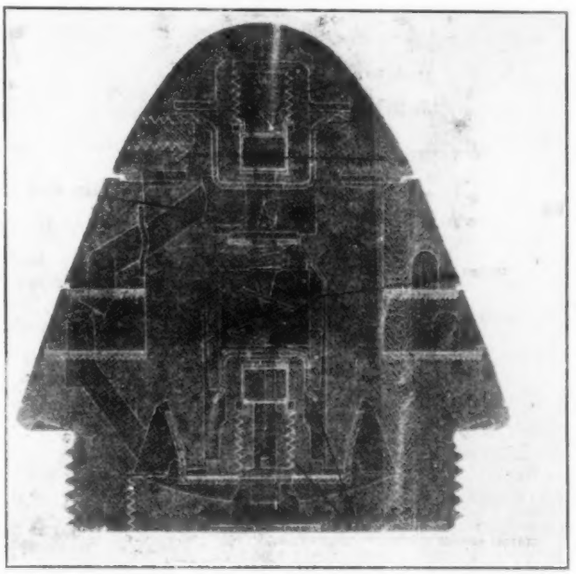
parts to stand the rigid tests and inspections which the Government applies or specifies in their requirements.

If the brass cartridge cases vary to any extent in the zinc content from seventy copper, thirty zinc difficulties will be experienced in manufacture and the product will not permit of being loaded three times. At one time the French military specifications considered uniformity so important that they went so far as to specify where the spelter and copper should come from. The reason ascribed for this is no doubt the fact that the analysis must be correct to give a minimum of scrap during manufacture. The great loads to which this material is put during manufacture under five hundred and eight hundred ton presses for indenting and heading, necessitates punches made of the best steel capable of withstanding approximately one hundred sixty pounds per square inch. Carbon steel of one and one-quarter per cent. carbon has been found to give best results in the first two sections, as the punches were built up of water quenched sections to 1,475 deg. F., and drawing at 430 deg. F. The remaining portion of punches were ninety to ninety-five per cent. carbon steel.

In determining the capacity of presses required, crushers of brass were made and tested on a Riehle one hundred ton testing machine and from these results the power of presses required can be calculated.

The pressures required for operations are:

	Pounds.
Cupping and drawing	15,000-40,000
Tapering 1st operation	8,000
Tapering 2d operation	20,000
Stripping after 1st operation	3,000
Stripping after 2d operation	11,000
Stripping after heading	16,000



DETAIL SKETCH OF FUSE HEAD FOR SHRAPNEL SHELL.

Scleroscope tests are generally made from day to day on the material and the results compared with analysis and only the raw material which comes within the scleroscope hardness numbers 20 and 25 are accepted and readings of either 15 or 30 are rejected.

The time fuse is one of the most important parts in shell construction and the small parts or material that enter in its construction. The fuse parts required are most interesting as the manufacture and loading of this piece is difficult and exacting. There are several grades of brass which enter into their construction, each of which is used for specified purposes and must come up to the following specifications:

Kind of metal, breaking elongation.

Delta metal used on:

Time and percussion pellets and plugs—Copper, 64-75; zinc, 34-1; lead, 1; yield, lbs. per sq. in., 44.

Hard rolled brass stirrup spring (yield, lbs. per sq. in., 26-880)—Copper, 60; zinc, 38; lead, 2.

Class A.—Ferrule and setting pin (yield, lbs. per sq. in., 44-800)—Copper, 70; zinc, 30.

Class B.—Metal rings (yield, lbs. per sq. in., 26-880) —Copper, 65; zinc, 35.

Class C.—Metal rings (yield, lbs. per sq. in., 13-440) —Copper, 60; zinc, 38; lead, 2.

Class G.—Percussion pellets, alternative (yield, lbs. per sq. in., 48-8)—Copper, 65; zinc, 35.

The following are details of these parts and how they are made. The stirrup springs are stampings and hold the time and percussion cap pellets from arming on the time needle and ferrule respectively. The time pellets should arm at from 125 to 165 lbs., and the percussion from 77-99 lbs., while ferrule arms at from 200-300 lbs. The ferrules must be accurately made to give the correct weight, the analysis of the metal must be right and the annealing accurately done for that analysis. If the zinc contents are high the metal will be harder and the temperature proportionately higher. This temperature varies from 850 deg. F. to 1,200 deg. F., and 15-20 minutes are allowed in the furnace, after which a water quenching batte is used. Some manufacturers make these ferrules from brass tubing, some use bar stock and some use sheet metal cupping or drawing them out chucking and then cutting off the blind end boring same and putting on a mandrel and turning the outside. The last method is very slow and the case possesses no advantage over the other two, which permit an output of large quantities on an automatic machine.

The percussion pellets are made of hard metal so that they will not deform on the explosion of detonator, thus causing the full force of the desired explosion to be in the correct place or direction.

The fuse body is cast in chill molds made of cast iron and conforms to the shape of same or in some cases they are cast in long round chill molds in 9 inch lengths and sawed off on power band saws to specified length and weight. They are then placed in gas-fired horizontal furnaces and fed in on one end by an operator and then extracted out at the other end when they are at a heat of 9 to 11,000 deg. F. They are then placed in a die and subjected to 120 tons pressure, which conforms them to the desired shape. In some cases these bodies are cast in sand moulds and shaped afterward in a die, which gives a similar result to die casting, this alternative, however, being practiced with less success as the ones cast in moulds or chills, which give a closer, finer grained casting and free from gas holes and also increase the breaking strength from 10 to 15 per cent. and with an increase of 20-25 per cent. in elongation.

Test bars are taken each day from the run of metal to find out if the proper ingredients are being used and coming up to the specifications. The machining of these fuse bodies is very close work and the limits are very low to go on so the tools have to be of the best. The illustrations show the various sections of an eighteen pounder shrapnel shell and a sectional view of a typical fuse and parts referred to.

STUDIES OF NONFERROUS ALLOYS

SOME RESULTS OF INVESTIGATIONS MADE BY UNITED STATES BUREAU OF MINES AT ITHACA, NEW YORK.

The nonferrous-alloy investigations of the bureau are being conducted by one alloy chemist and one assistant alloy chemist at Cornell University, Ithaca, N. Y., under a cooperative agreement with the university by which the facilities of the chemical laboratories, and in particular of the extremely well-equipped electric-furnace laboratory, are available for the bureau's work.

The problem under investigation concerns mainly the metal losses in the nonferrous-alloy industry, particularly in the brass industry. This work has been in progress nearly four years, starting with a study of existing methods of brass melting to ascertain the metal losses, fuel conumption, crucible life, etc., in the various types of fuel-fired furnaces. The results of this study are given in Bureau of Mines Bulletin 73*.

From the point of view of the theorist, electric melting of brass should offer marked advantages over existing methods, mainly in the reduction of losses of zinc from alloys high in zinc content, such as yellow brass, manganese bronze, and German silver, in lessened danger of oxidation in the melting of such allows as the bronzes and red brasses, and in the possibility of replacing the present method of melting in crucibles of comparatively small capacity, with attendant high labor cost, as used in brass rolling mills, by a method capable of operation with much larger melting units.

The correctness of the theory of the decreased melting losses in electric furnaces of suitable types has been established by a long series of experiment in various types of furnaces.

DEVELOPMENT OF ELECTRIC BRASS-MELTING FURNACE.

The problem then became one of finding an electric furnace capable of reducing the metal losses and giving the other advantages of electric melting with such a high consumption of electric power as to make its commercial operation show an over-all saving in melting cost. Almost any electric furnace will melt brass. Many types will reduce zinc losses, though some will not. But to find a furnace that combines all the required factors of metal saving, power efficiency, low upkeep cost, reliability and general applicability to the needs of the brass industry has been no light task.

In the search for such a furnace many types have been built and operated by the bureau on an experimental scale.

Several commercial films have made tests of electric brass furnaces on a commercial scale, and in almost all cases these firms have co-operated fully with the bureau, allowing representatives of the bureau to attend these tests. Neither the laboratory experiments of the bureau nor the trials of the private parties showed much promise of commercial success until the past fiscal year. During this period, however, two different types of electric furnaces tried by private parties have shown promise. One of these types is fitted only for use on material low in zinc, and its margin of saving over present methods is somewhat problematical under normal conditions. At the present price of crucibles it may profitably replace crucible furnaces under favorable conditions.

The other type of furnace is applicable to alloys high in zinc, and although so far tried only in small sizes, offers great promise for certain phases of the brass industry. It has its distinct limitations, however.

The bureau has built and operated on a laboratory scale a third distinct type of electric furnace which has shown marked promise. This furnace promises to meet conditions for which the other two types are not well suited, although for many conditions one of those two forms will be preferable.

The laboratory furnace developed by the bureau is shown in Plate XII, *A*. The furnace rests on a track

* Gilett, H. W., Brass-furnace practice in the United States; Bull, 73, Bureau of Mines, 1914, 298 pp., 2 pls., 23 figs. The Metal Industry, August, 1914.

set on brick piers. Below the furnace track is another track on which a buggy runs to carry ingot molds. The furnace is rocked back and forth by the projecting handles shown. Adjustable electrodes between which an electric arc is formed are introduced at the ends of the furnace along its axis. The opening shown closed by the clamp in Plate XII, *A*, constitutes a combined charging door and pouring spout.

Arrangements have been made with a large central electric power station for the building and co-operative testing of a furnace of the type worked out by the bureau. of the other types of commercial furnaces and hopes soon The bureau is keeping in close touch with the progress to be able to publish a report that will bring out the

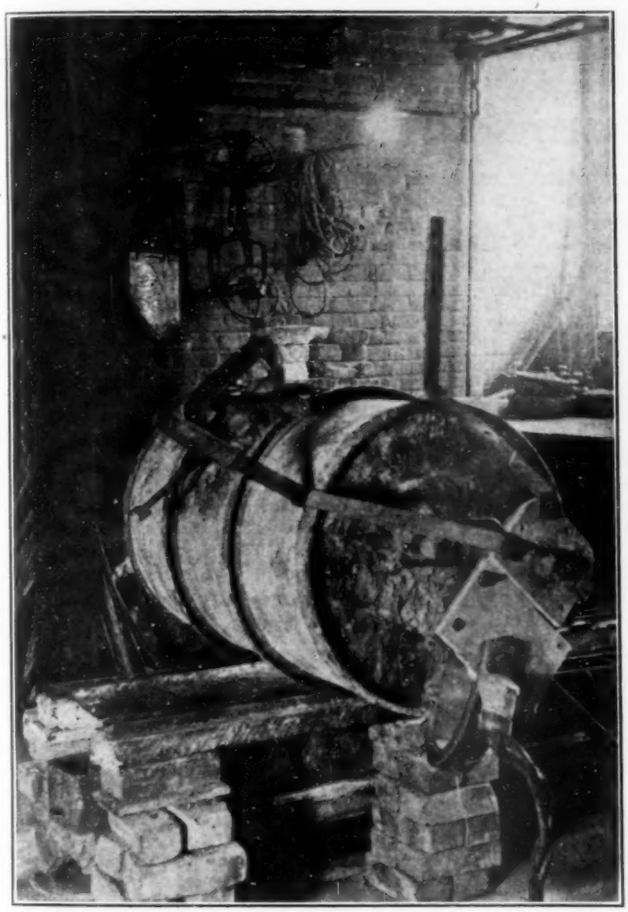


PLATE XII. ELECTRIC MELTING FURNACE DESIGNED BY THE BUREAU.

possibilities and limitations of electric brass melting. It seems almost a certainty that in a few years electric brass melting will have a strong foothold in the brass industry and that the electric furnace will prove a means of notably decreasing the Nation's loss of metal in brass melting, which in normal times is about $3,000,000 per year and in the past year of large production and high metal prices has probably been nearer $10,000,000.

The American Institute of Metals is officially co-operating with the bureau in its work. Great interest has been shown in the electric brass furnace work by brass founders, rolling-mill men, and electric-power companies.

PYROMETER DESIGNED BY BUREAU.

In the work on the electric brass furnace it became necessary to measure satisfactorily the temperature of the molten metal. For such service a pyrometer that will combine accuracy, long life and speed of reading is essential. No pyrometer on the market is fully satisfactory for this purpose, but in the bureau's work one was devised that has given good service for laboratory use.

Figure 6 shows the details of the bureau's pyrometer. The protecting tube consists of a nickel tube which is tipped with molybdenum and encased in a tube made of silifrax (graphite coated with SiC), as shown in the figure. The thermocouple consists of a platinum element and a platinum-rhodium element carried in Marquardt porcelain insulating tubing, as shown. The graphite and molybdenum only come in contact with the molten metal, and neither is attacked by it. The nickel tube resists oxidation. The small molybdenum tip

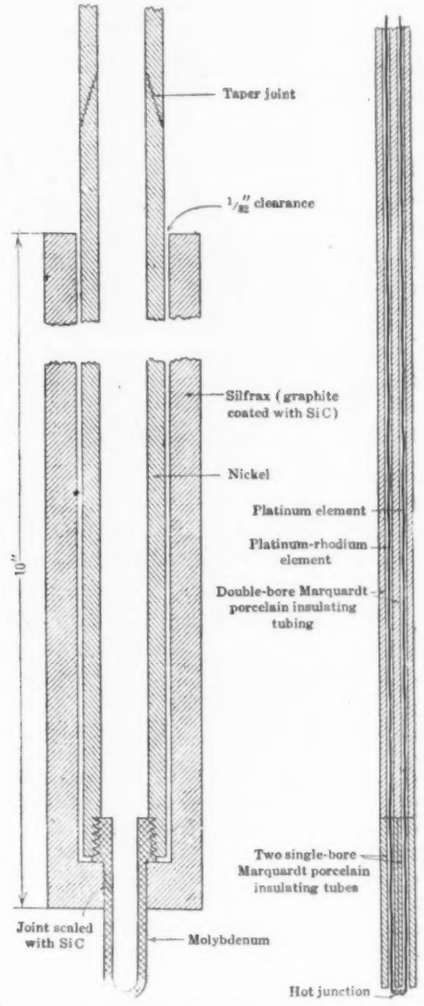


FIG. 6. THE BUREAU'S IDEA OF A PYROMETER.

heats up quickly, the lag of the device averaging 50 seconds in metal at 1200 degrees C. with the tip cold at the start. Other nickel tubes are threaded into the lower one to give a tube 3 or 4 feet long, and the outer end is fitted with any suitable handle.

Temperature control is of vital interest to the brass founder and to the rolling-mill operator, as on the temperature rests not only the quality of the goods produced, but also to a greater or less degree, the metal losses, fuel consumption, etc. The bureau has, therefore, taken up the problem of finding a pyrometer for use in molten brass and bronze which will not only serve the requirements of the laboratory but also the needs of the foundry

and the rolling mill. This problem seems now to be in a fair way to a satisfactory solution.

MELTING OF ALUMINUM CHIPS.

Another problem dealing with metal losses in non-ferrous alloys has been a study of methods of melting aluminum chips such as are produced in the machining of the aluminum alloys used in motor-car construction.

These fine chips are hard to remelt without excessive loss, a 40 per cent loss being not uncommon. This loss costs the Nation in normal times about $200,000, and in the past year, on account of the extraordinarily high price of aluminum, has probably been nearer $600,000.

Some few refiners have been able to get a recovery of 85 to 90 per cent of the metal content of the chips, but knowledge of the necessary details of the methods has been confined to a very few. The bureau has studied the various methods in detail, with the co-operation of several prominent refiners, and the results of the work published in Bulletin 108[2], will, it is believed, inform anyone having to deal with this problem how to procure high recoveries and avoid excessive loss.

An interesting point in this work was the establishing by a series of experiments that the reason commonly accepted for the difficulty of melting aluminum chips without high losses—oxidation of the metal within the furnace—is probably far from being the main reason. The main cause of trouble seems to be the lack of ready coalescence of the metallic globules, which means that the problems is one of colloid chemistry applied to metals.

The co-operation of Prof. W. D. Bancroft, of Cornell, an eminent authority on colloid chemistry, was of great value in the work on this problem.

[2] Gillett, H. W., and James, G. M., Melting aluminum chips: Bull. 108, Bureau of Mines, In press.—The Metal Industry, October, 1915.

BRASS DIE CASTINGS

A Short Survey of Modern Practice.

Written for The Metal Industry by Adolph Bregman.

The production of brass die castings is a problem which has long puzzled the manufacturer. Die casting in general which was once an unknown quantity, has progressed greatly, but more in the field of white metals than red. A number of alloys are being turned out with zinc, tin, lead or aluminum as the base, which are highly satisfactory. A few of them are as follows:

(1)	Zinc	88%
	Tin	8
	Copper	4
(2)	Tin	86%
	Copper	6
	Antimony	8
(3)	Lead	83%
	Antimony	17
(4)	Aluminum	92%
	Copper	8

With brass, however, the difficulties are increased greatly. In the first place the die is very expensive. It should make at least 10,000 to 12,000 castings in order to pay for itself. With white metal 40,000 is not unusual, but with brass the figure often goes below 1,000.

The high temperature required to melt the alloy, together with the strains induced by the excessive expansion and contraction of the casting cause rapid deterioration of the die. It is plain that castings with long through holes and undercuts are impossible. Also there are definite limits as to the size and weight of the pieces turned out.

Drilling, instead of casting long core holes adds so greatly to the cost that the process loses its advantages. It more than counterbalances the machining which is avoided.

As yet it has not been found feasible to use casting machinery. A machine, requiring as it does, accurately dimensioned parts, would have to have an iron container for the molten metal. At the temperature of molten brass the iron becomes corroded and the brass contaminated.

Becuase of their great cost the number of dies must be kept at a minimum. Therefore the pouring has to be intermittent; often with long waits. The copper oxidizes and forms dross, which is both expensive and difficult to reduce. Often the recovery is less than 50 per cent.

Nevertheless, in spite of these difficulties, brass and bronze die castings have been produced successfully. The American Metals Products Co.[1] of Milwaukee, Wis. has succeeded in manufacturing connecting rods, bearings, valves, turbines, gears, cams, etc. of bronze. Of course there are some limitations. The snapes must be simple; the weight, between one-half ounce and three pounds; there must be no long cores. The alloy must be made up of metals of high quality and must be of such composition as will insure great strength and stable equilibrium at all temperatures below that of actual volatilization.

As regards accuracy, the castings are very satisfactory. They check within .005 of an inch.

For the die, a special steel is used which resists the attack of the bronze. As regards the alloy, the omission or reduction to a minimum of the zinc was found to be of great assistance. In the first place the corrosion of the die was greatly reduced. In the second, the new alloy did not crack when ejected from the die. Ordinary brass, when removed from the die, undergoes a much greater change in size than the bronze turned out by the American Metals Products Co. In addition, the strains are still further reduced by removing the casting from the die in as short a time as possible.

It is possible that a steel that has been found satisfactory for drop-forging dies would be of some assistance in performing some experiments with casting dies. One such steel contains the following:

Carbon	.75 %
Manganese	.25
Silica	.15
Sulfur	.015
Phosphorus	.015

[2]The treatment consists of annealing, preheating, heating for hardening, quenching, preliminary testing, drawing and final testing.

It should be remembered, however, that the conditions of the two processes (i. e. drop forging and casting), differ widely as to heat and type of strains. As yet no data is available which gives the composition of a steel which will resist the action of copper-zinc alloys.

[1] Machinery, Jan., 1916, p. 411. "Bronze Die-castings," by Peter J. Weber.

[2] Machinery, Feb., 1916. "Heat Treatment of Drop-Forging Dies."

EDITORIAL

Vol. 15 NEW YORK, JULY, 1917 No. 7

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS.
Published Monthly

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE $1.00 PER YEAR, POSTPAID TO ANY PART OF THE WORLD. :: SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order : Cash Should Be Registered

ADVERTISING RATES ON APPLICATION
FORMS CLOSE THE FIRST OF THE MONTH

Palmer H. Langdon - - - - - - - - - Editor and Publisher
Louis J. Krom - - - - - - - - - - - Managing Editor
George W. Cooper - - - - - - - - - Advertising Manager
Thomas A. Trumbour - - - - - - - - Circulation Manager

ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK.
Telephone Number John 689. Cable Address, Metalustry

CONTENTS

CONVENTIONS IN WAR TIME

With the entering of the United States into the world war a hysterical wave of so-called economy swept over the country. Had it not been for the wiser heads who warned the people through the press and from the lecture platform that there is such a thing as too intensive economy there might have been a serious business panic. Conservation of resources is one thing and an unnecessary tightening up of purse strings is another. There is no practical or moral reason why a man whose income remains the same should not continue to live at the same rate. Business is the buying and selling of various things and as long as things are bought they can be sold but as soon as buying stops then selling stops and business dies. Such a condition would ensue if everybody started on a system of retrenchive economy which the conditions now in force in this country do not warrant. What we need to do is to stop the unnecessary waste that we, as a nation, indulge in and then there will be enough and to spare for everybody.

In line with the economy idea came the cry, by a few, that the custom of holding annual meetings of business men, societies and organized bodies should be abandoned and no conventions be held during the war. The principal argument put forth in favor of this move was that the railroad facilities could be better employed in moving troops, food and supplies. It does not seem to us that there is very much to be said on this score. There are so many other things to be considered that are contributory to railroad embargoes that the slight extra burden caused by convention movements can be considered negligible. In this connection the Merchants' Association of New York took up the matter and addressed a letter to President Wilson and received an answer which was in line with the thought of the Association. The letters are as follows:

THE LETTER:

"It has come to the attention of The Merchants' Association of New York that there is a tendency to forego the holding of conventions and general commercial meetings by business interests of the country because of a desire to practice alleged economy during the war.

"In our judgment this is a false idea of economy, the application of which will be harmful, rather than beneficial, both to the Government and to the Nation's business. Such gatherings, in our judgment, should be encouraged rather than discouraged, because failure to hold them as usual is likely to create a false impression, to stimulate a lack of business confidence and to discourage mutual co-operation which is so necessary under existing circumstances. Conventions and gatherings of different trades and industries afford an exceptional opportunity on the part of business men composing them to study the effect of the war situation upon industries, so that they may be best equipped to serve the needs of the Government and to serve the normal business of the country. Both business and general conventions

also afford exceptional opportunities for patriotic gatherings and the fostering of patriotic sentiment.

"We, therefore, respectfully suggest that, if in your judgment the continuation of such meetings is beneficial, a public utterance by you to that effect would be of value and would have a marked influence both in stimulating such gatherings and in perpetuating the results flowing therefrom. It seems to us that if ever the citizens of this country should get together, whether in business or general organization meetings, it is during such a period as that through which we are now passing."

By WILLIAM FELLOWES MORGAN,
President.

THE ANSWER:

THE WHITE HOUSE
WASHINGTON, June 8, 1917.

My dear Mr. Morgan:

The President asks me to acknowledge the receipt of your letter of June 6th, and to say that he agrees with you that there is no sufficient reason for foregoing the holding of conventions and general commercial meetings by business interests, so far as he can see.

Sincerely yours,
J. P. TUMULTY,
Secretary to the President.

The success of the Fifth Annual Convention of the American Electro-Platers' Society, just held in St. Louis, Mo., July 5 to 7, bears witness to the soundness of the views held by the President, the Merchants' Association and the country at large. As is told in the account of the platers' convention in the opening pages of this issue of THE METAL INDUSTRY, the interest and enthusiasm were unflagging from the first to the last day. It proved that the platers and their employers have unbounded faith in the business future of the United States and were not willing to let any opportunity go by for adding to their own store of knowledge and to impart what they know to others. Had conventions been abandoned all of the good done by this particular convention would have been missed and the large number of persons engaged in the finishing of metals would have been heavy losers.

The next convention for 1917 of interest to the metal worker is that of the Allied Foundrymen's Association together with the exhibition of foundry supplies and apparatus. This, as is told in another column of this issue of THE METAL INDUSTRY, is to be held in Boston, Mass., the week of September 27. That interest in this event is not lacking is shown in the list which we publish of the intending exhibitors. With the exhibition nearly three months away the number of exhibitors and amount of space to be occupied exceed that at Atlantic City in 1915. The sessions of the associations promise to be better attended, more papers will be read and discussed and keener interest is being shown all around. There is every reason to believe, basing our opinion upon the signs of the times, that the business of the United States is going straight ahead while the nation is engaged at the same time in taking a most active part in the greatest war the world has ever seen.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY

CONSERVATION FOR THE ELECTRO-PLATER

AN ADDRESS GIVEN BEFORE THE BRIDGEPORT, CONN., BRANCH OF THE AMERICAN ELECTRO-PLATERS' SOCIETY, MAY 12, 1917, BY GEORGE B. HOGABOOM.

The present demand for conservation comes with great force to the electro-plater, for the materials which he has used without realizing their value in the past have now so advanced in price that substitutes must be found or ways and means devised to economize in their use.

If you will but consider one case of waste—the rinse water. How little it is realized what a vast amount of material is carried away by taking the work from the tank and rinsing in running water which is carried to the sewer. The rinses from gold and silver have been saved, but how about the metal and the cyanide of brass and copper solutions? The present cost of cyanide and that of metals makes it profitable to save wherever possible no matter how small the volume may be. You will, however, be amazed when the value of those materials in your wasted rinse water is considered. A great deal of solution is carried away mechanically, and it should be saved and returned to the tanks.

A study should also be made of the amount of cyanide necessary to successfully operate a solution. Too many are in the habit of adding any amount, basing the calculations upon guess work, which is more often wrong than right. If a solution is well balanced it can be operated with very little cyanide. On the other hand, the constant addition of it will materially increase the inert matter and gradually call for an increased consumption. The only way to do is to apply scientific control principles to your solutions. The time is coming when you will be compelled to do so. The manufacturers of today are awakening to the necessity and value of control work. They are applying it to other departments and the plating room will not escape. If you are ready to meet the change it will be to your advantage. If not, a chemist will be placed over you, and in a very short period he will master the details and show a saving that will be a boomerang to you. The several branches of the American Electro-platers' Society have laboratories in which you can work out your problems and men have volunteered their service to help you. Yet it is with regret that it must be stated that an indifference is shown by a great majority of the members, and it is only a very few who are accepting the opportunity. They are the ones who will not be found wanting and who will be able to meet the new conditions and receive the rewards of their hard labor.

To illustrate the point that conservation is rapidly taking hold, let me tell you of two cases which came to my notice in the past few weeks. While going through one of the largest automobile factories in the West, it was noticed that the waste paper and other waste materials were being treated in a peculiar manner. Upon inquiry it was learned that all the waste non-metallic material in that vast plant was gathered

together and converted into a container for the electrolyte of the storage battery. Waste material that was formerly burned or thrown upon the refuse heap is now made into a sort of fibre board container.

In the years gone by you have seen large heaps of scrap steel around machine shops, but if you will watch the railroads today you will see that material being sent somewhere. It is but another case of conservation of waste material, and in this particular case the product is one that must stand a most severe test. The scrap steel is placed in a huge electric furnace, melted and poured into molds to be made into automobile gears. You think it hardly possible, yet it is, through the one way in which plating rooms can be successfully and economically operated—control work. After the scrap mass has become molten a ladle is dipped into it and a sample taken. This sample is allowed to cool, broken and the fracture examined. If it is not just right, at a stated later time another sample is taken. When the right point is reached the sample bar is sent to the laboratory. There the exact composition of the molten metal is ascertained and the necessary additions to bring the product to a certain standard figured out. When the additions are made and the metal poured the metallurgist is most confident that it will stand the test, that it will meet all the requirements of the processes to follow, that when the automobile is assembled and his product is called upon to meet a sudden emergency that may mean the loss of life in case of failure it will not fail. Such confidence can only come with a knowledge of the material with which you work and a definite control over the many operations through which it must pass. It required study, careful hard study and scientific control work.

The electro-plater can have the same confidence. He can know just what his solutions will do, but to gain that point he must take hold of the opportunities offered by the American Electro-platers' Society and not be willing to accept things as they come as a condition that cannot be controlled. It can be, and it is up to you to do so.

LUBRICATING A COMMUTATOR

To the Editor of THE METAL INDUSTRY:

I notice on page 262 of your June issue, an inquiry regarding heating of commutator on direct current machine. I assume the machine is probably a low voltage machine, and as I had some trouble along that line at one time, perhaps my experience will be of assistance to your correspondent.

The generator which I was using was a 10 volt machine, delivering 60 ampere current, and the trouble appeared both in heating and in scoring the commutator. I think in the first place the commutator was designed with too small a diameter, so that it was particularly subject to these troubles. We were at first using brushes made of copper gauze, and we put these in various positions and at various tensions without any resulting improvement. We tried various commutator lubricants also without doing any good. We also tried soaking the brushes in a mixture of graphite and paraffin, but this did not help very much. We then tried carbon brushes, and found that they did not score the commutator so badly, but they were still subject to overheating and their resistance was too great for a machine of such low voltage. We finally got the commutator to working pretty well by the use of a special brush which was composed of a carbon and copper mixture. In this brush both the copper and the carbon are very finely divided, evidently being mixed together thoroughly and then subjected to compression.

I regret that I cannot give the address of the maker of these brushes, but you will probably be able to find out who can furnish them.

R. F. WOOD,
Sandusky Foundry & Machine Company,
June 12, 1917. Sandusky, O.

THE MERCHANTS' ASSOCIATION OF NEW YORK

To the Editor of THE METAL INDUSTRY:

We are writing you because we think your attention must be called frequently to manufacturers who could be greatly benefited if they knew of the service which we offer. These services, which are described below, are given entirely without charge, as the purpose of The Merchants' Association is service to New York rather than financial gain.

An astonishingly large number of manufacturers are at all times locating in the vicinity of New York. Their problem of finding the best location is an intricate and puzzling one. This is not strange in view of the fact that the industrial district of Metropolitan New York contains 20 important cities, and many smaller communities in addition to the five great boroughs of Greater New York. For several years we have performed a valuable service to such manufacturers in aiding them to select the particular location best suited to their requirements and furnishing them with information concerning the many industrial factors with which they may be concerned..

Our attention has frequently been called to the fact that most manufacturers learn of this phase of our work only after they have become established and cannot avail themselves of it. For this reason we are attempting to get in touch with such manufacturers early enough to be of aid to them in locating their plant. This is a difficult thing to do, inasmuch as we are not seeking to induce manufacturers to locate in New York, but merely offering our services to those who are coming here.

We will appreciate your kindness in calling this matter to the attention of manufacturers who, you may learn from time to time, are interested in a New York location, and in showing this letter to those in your office who may be in a position to use this information.

THE MERCHANTS' ASSOCIATION OF NEW YORK,
By ALFRED L. SMITH,
Manager, Industrial Bureau.

June 11, 1917.

[THE METAL INDUSTRY takes pleasure in publishing Mr. Smith's letter. Very often concerns desiring to locate in New York or vicinity are at a loss to know where to get the necessary information. We are sure that great benefits are to be derived by such concerns as avail themselves of the service thus rendered by The Merchants' Association.—Ed.]

CRUCIBLE STANDARDIZATION

To the Editor of THE METAL INDUSTRY:

Your paper being the leader and up-to-date in foundry methods, or supposed to be, at least, what do you think of calling the attention of the brass foundries of the country or ask them what their ideas are about buying crucibles on a performance basis or heat basis rather than so much per number, regardless of the quality of the crucibles? Tell them that such a movement could be inaugurated and their views would be appreciated. We would then be willing to go to the expense of getting some postal cards up and have them mailed out so that from their answers we could get a line of the general attitude of the country in buying crucibles in this way.

G. H. AMES,
New York,
June 15, 1917.

NEW BOOKS

Office Organization and Management, by C. C. Parsons, 6 x 8½ inches, 314 pages including index. 60 illustrations. Bound in limp leather. Published by the La Salle Extension University. For sale by THE METAL INDUSTRY.

The intricate details of the organization and management of an office are broadly and ably covered in the subject matter contained in this book. In compiling the work a great number of large industrial concerns have been consulted by the author, and the best and most efficient parts of the various systems have been freely drawn upon to make up the information here set forth. For business men, office workers, office manager, general manager and the student of business who desires systematized and well-organized knowledge on the principles and methods of successful office organization and management, this book should prove quite valuable.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating-Chemical

BRAZING

Q.—We are anxious to obtain a brazing compound which will allow us to braze cold drawn steel without necessitating an extreme heat and still allow us to draw the compound through a riveted seam with 1¼ lap. We are inclined to believe that the maximum temperature during the brazing operation should not be higher than 1,300 degrees Fahr. We understand that there is a compound which will allow us to do this work and which acts in such a manner as to cause the brazing metal to remain in the joint alone and leaves a clean surface.

A.—Ordinary brazing soldering consists of copper 50 per cent. and zinc 50 per cent. and its melting point is about 1,560 degrees Fahr. It is used as a rule with a flux of borax. Borax has a melting point of approximately 1,040 degrees Fahr.

Where it is necessary to have a lower melting solder than the above, silver solder is used. It consists of 50 per cent. silver and 50 per cent. yellow brass melted together, cast into ingots and rolled as thin as possible, preferably not thicker than .003 inch. This solder is expensive, but its low melting point (1,250 degrees Fahr.) and the fact that it gives a ductile joint that can be wrought or drawn, will often decide a manufacturer to use it for important work. Borax is also used as a flux with silver solder.

Where it is desired to leave a clean surface and have the brazing solder remain in the joint, care should be taken not to use an excess of borax. Borax glass or borax that has been fused and pulverized will be found more satisfactory than the ordinary powdered borax.

A plastic soldering paste consisting of finely divided hard solder, gum tragacanth and sulphuric acid is used in Germany and is said not to spread in the manner of ordinary fluxes and solder, but its practical value is unknown to use.—J. L. J. Problem 2,458.

COLORING

Q.—How may we obtain a burned-on color as near a grass green as possible on bronze rails?

A.—A grass green verde is a somewhat difficult finish to produce, but the following instructions may be of some service. Add carbonate of copper to muriatic acid until a mixture equal to paint is produced; then to this mixture add some white vinegar, say about two ounces to a pint of the prepared copper and acid. Then add a little more copper if necessary to produce the required consistency. Apply this mixture to the bronze rail with a brush the same as in painting. Dry by heat and finally coat the surface with beeswax made up with turpentine to the consistency of paste and polish with a flannel cloth.

Another method is to darken the bronze surface with polysulphide or some sulphur combination, dry and lacquer with a French varnish lacquer consisting of 1 part of French varnish and 1 part of a mixture prepared from equal parts of fusel oil and amyl acetate. This mixture comprises the thinner. When the lacquer is dry apply a thin coating of a semi-paint prepared from light chrome green in dry powder form, and mix this with turpentine and just a very little turpentine copal varnish to the consistency of a thin paint. Add some orange chrome as a tint to the chrome green to give a grass green. Care should be used to add only a little varnish, as otherwise the color will dry tacky or like paint instead of a flat, dull finish. About a teaspoonful of varnish to a pint of the turpentine and color will be sufficient. Apply the color to the lacquered rail by the aid of a soft brush; one coat will be sufficient. Dry by heating and polish with cloths to which a little wax is applied.

If care is taken and the correct quantity of varnish is used in the mixture, the paint should rub down with an egg shell finish.—C. H. P. Problem 2,459.

FINISHING

Q.—How can an article, after finishing in Roman gold, be antiqued; that is, eliminate its newness and yet not destroy the original workmanship?

A.—To produce an antique gold effect of the Roman gold finish we would suggest that you try the following combinations and determine which produces the most satisfactory results:

1.

Water	1 pint
Sulphate of copper	4 ounces
Muriatic acid	4 ounces

Heat to 160 degrees.

2.

Hyposulphite of soda	8 ounces
Acetate of lead	½ ounce
Water	1 quart

Temperature, 160 to 180 degrees.

3.

Sodium nitrate	12 ounces
Common salt	4 ounces
Muriatic acid	2 ounces
Water	1 pint

Heat to 160 or 180 degrees.

Immerse the articles in either of the solutions for a few seconds, and if a lustre is desired rub up in silver sand.—C. H. P. Problem 2,460.

MACHINING

Q.—In operating our turret lathes and when reversing from right to left we have had considerable trouble with the overhead belts on the countershaft attached to pulleys on the main line drive shaft running off, and sometimes the cone belts. Can this not be remedied by the use of a good belt dressing?

A.—A good belt dressing will increase the adhesiveness and pliability of a belt and by permitting use of the belt with less tension may cause it to track better when you reverse, but a dressing cannot be depended upon to prevent the belts from flying off the pulleys if the pulleys are out of line or are not provided with crowned faces.

By increasing the width of the pulleys on the line shaft will lessen the trouble and allow you to run the belts at a less tension and save repairs on the countershaft.—P. W. G. Problem 2,461.

MELTING

Q.—We have a considerable quantity of mixed brass and aluminum turnings which we wish to convert into ingot form. If we melt them in the ordinary way we find that the mixture flies from the pot in a dangerous manner. Can you inform us as to what causes this, and if there is any method of melting which would obviate it, or is there any flux that could be used to get the metal down?

A.—The mixture of brass and aluminum turnings as it melts in the crucible forms what is practically a thermit mixture, and the evolution of heat must be very considerable if there is any great proportion of aluminum present. If it be desired to melt down to get aluminum brass ingots, then it will be necessary to have a quantity of molten scrap metal in the pot, well covered with a flux of carbon, salt and borax in equal parts, and through this the turnings may be introduced in small quantities at a time,

preferably pressed into small round briquettes made by a press. In this way only a small proportion of aluminum will be got rid of into the slag, which must be skimmed well off before pouring, and if the metal cannot be procured with the brass and aluminum separate, then the only other way to keep the aluminum completely out of the melt is to effect a mechanical separation. This cannot be done, as can the extraction of iron and steel from brass turnings, by a magnet, and the most favorable plan is to wash them over a concentrator table, when the crushed metal can be got separate, but this is often an expensive process, and the metals must be perfectly dry before they can be melted down.—H. P. Problem 2,462.

MIXING

Q.—In the following formula for manganese bronze, what is the function of the iron, manganese, tin and aluminum? Also, the effect of increasing or decreasing the amount of each? Copper 56, zinc 42, iron 1.5, 80 per cent. ferro-manganese .5, tin 1, aluminum .5.

A.—In a general way it may be said that iron, manganese tin and aluminum act as strengtheners and hardeners in manganese bronze. If the aluminum is omitted from the above mixture and the iron, manganese and tin reduced by half, a mixture is obtained that is not suitable for sand castings, but it is one that is very soft and ductile and adapted for hot rolling. Manganese probably protects the iron of the manganese bronze from oxidation just as it protects iron from oxidation in the manufacture of steel. While both the manganese and aluminum are deoxidizers and ordinarily used in very small amounts, they may both be largely increased, the aluminum to about 8 per cent. and the manganese to about 15 per cent. without any diminution of ductility. In fact, alloys with these amounts of aluminum and manganese may be rolled. Slight increases of the tin can be made without excessive hardening of the manganese bronze.—J. L. H. Problem 2,463.

PLATING

Q.—We have been advised to use 4 ounces of phosphate of soda and 4 ounces of cyanide for making a fine gold solution, but we find that by using phosphate of soda the solution turns dark, or about the color of strong coffee. We seem to obtain a fairly good color from the solution, but would like to know if it is usual for them to turn dark when the soda is used.

A.—By dissolving the phosphate of soda in one-half the water to be used and the cyanide in the other half, then mixing them together, a perfectly clear solution will be the result. If the cyanite and phosphate are added to a cold solution it must be kept constantly stirred until both ingredients are dissolved or the solution will invariably turn dark brown in color.—O. A. H. Problem 2,464.

Q.—We are using a 12-volt, 120-ampere machine for nickel and copper plating barrels, each containing 50 gallons of solution. The dynamo works all right on the nickel, but we are unable to get very good results from the copper. The copper solution is made up of cyanide and heated to about 120 degrees Fahr., and stands at 12 degrees Baume. We are plating small iron articles, such as buttons, pins, etc. About a peck of the articles are nickel plated first and then pickled and finally plated in the barrel. Fifty per cent. of the articles do not plate at all, while the plate on the other half is rough, brittle and strips off. If small quantities of the articles are plated at one time they come out with a good copper plate, so I am under the impression that the trouble is with the current.

A.—A dynamo generating 120 amperes at 12 volts apparently should be large enough for two mechanical tanks of 50 gallons' capacity. The voltage is surely ample, but the surface area of the work to be plated determines the amperage. Such articles as you plate, if the total area was measured, would approximate many square feet.

It may be possible that your copper solution is very low in conductivity and may even require more free cyanide. This would be indicated by the deposit being rough, brittle, non-adherent and only portions of the batch of work becoming plated. To determine where the trouble lies add to the copper solution 1 ounce of sodium cyanide, 1 ounce of soda ash, 1 ounce of caustic soda and ¼ ounce of hyposulphite of soda per gallon of solution. If the results then from the copper solution are not satisfactory, then the solution either wants additional metal or the amperage is too low to carry on deposition in the two barrels at the same time.—C. H. P. Problem 2,465.

POLISHING

Q.—We have an unusually hard proposition in the polishing line. Our work is mostly heavy, such as steel finish plate work, and since Turkish emery has become a scarce article it has hindered us getting out our work. We have tried American emery with very poor results, and would like to know what class of manufactured goods is giving the best results on steel.

A.—Alundum is being used in the place of Turkish emery with even better results. A great many of the stove concerns are using this material. Alundum is used on a little different basis; for instance, where 180 Turkish emery has been used, 160 Alundum gives equally as good results.—C. H. P. Problem 2,466.

STRAIGHTENING

Q.—We are drawing some small fuse rods up to about ¾ inch diameter, and find it rather difficult to get the rods straight after we have got them to the correct size.

A.—The simplest method of straightening the rods would be to fix one end in a clamp to a bench and bend them in the required direction, turning the rod round and making the bend at the point required. This method, however, is tedious and inaccurate. Several types of straightening machines are made by firms specializing in rod and other manufabcturing plant. A simple form consists of a bench fitted with V-blocks, against which the rod is placed and straightened by means of a hydraulic ram. In one such machine, the ram is 5¼ inches diameter, 9-inch stroke, and has a working pressure of 1,500 lbs. per square inch.—W. T. F. J. Problem 2,467.

STRIPPING

Q.—We made up a large nickel strip of sulphuric and nitric acids and by mistake a considerable amount of salt was added, as in a bright dip. Can anything be done to neutralize the salt? It is now practically useless as a strip, a two-hour immersion being necessary in some cases to strip the work. We have no containers large enough to hold the solution or we would save it until our present bright dip wears out.

A.—The only remedy for the nickel strip is to add sufficient sulphuric acid until the strip works normal again. The common salt cannot be removed, as it has already combined with the sulphuric acid and formed muriatic acid in solution. Some water may be added if the nickel does not strip evenly and quickly.

An electro-strip for removing nickel from brass and steel surfaces is being used a great deal and consists of 75 parts of sulphuric acid and 25 parts of water. Arrange as a plating solution, but with a reversed current. The articles are made the anodes and sheet lead is used as the cathode. The voltage should be from 3 to 4.—C. H. P. Problem 2,468.

TINNING

Q.—Noting in one of your recent issues a question asked regarding proper solutions to use for tinning by electricity, we would like to know whether or not tinning by electricity is as satisfactory, both from appearance and wearing qualities and rust resisting, as the method now commonly used where the steel is dipped in the molten tin.

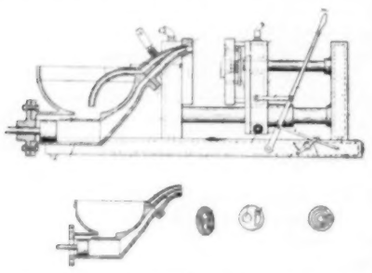
A.—For your purpose the molten tin method is best adapted. Electro deposited tin is of a dull white finish and can be brightened by brushing with steel wire brushes or buffed by the regular methods, but the finish is not so effective as the molten method, as it does not have a silvery lustre. The cost of the electro method would be less than the molten method, providing you have regular plating room equipment.—C. H. P. Problem 2,469.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

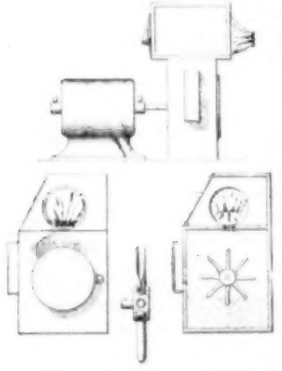
1,226,408. May 15, 1917. **Die Casting Machine.** L. P. Tenca, Cleveland, O.

The present invention relates to casting mechanism and is designed particularly for use in a machine for casting under pressure, which is a method employed in forming small articles which must be cast to very close dimensions and with smooth finished surfaces, thus obviating the necessity for further machining. It is well known that the difficulty with this method of casting is the escape of the air confined in the empty mold chamber, and that if this air does not escape, it diffuses through the molten metal, and produces a casting containing many blow-holes, and even if so well diffused that no blow-holes are produced, it nevertheless renders the casting lighter and weaker than is desirable. The present invention relates to a mechanism, as shown in cut, which entirely eliminates this difficulty, and is provided with means for accurately controlling the temperature of the metal poured into the mold chamber.



1,226,621. May 25, 1917. **Sand Blast for Finishing Metals.** Emil Gieland, Charlotte, N. C.

This invention relates to new and useful improvements in sand blasting apparatus for satin finishing or frosting metals, and consists in a simple and efficient device of this character having various details of construction and combinations and arrangements of parts, as shown in the cut.



Sand of proper fineness is placed in the lower portion of the casing and, when the fan is given a rapid rotary movement through the power mechanism, the suction produced by the fan causes air to be drawn into the casing through the passageway provided therefor, and the rapid suction produced by the rotary fan will cause the sand to be drawn up and thrown forcibly aaginst the article to be satin finished.

What is claimed as new is: In a sand blast apparatus, a casing including an upper chamber and a lower sand containing chamber, a partition between the chambers and having a central opening therein, a wheel journaled within the sand containing chamber, said wheel being supported in a plane directly under the central opening, scoop-shaped members provided on a wheel, said scoop-shaped members adapted to scoop up sand and throw the same toward said opening, and means for rotating the wheel.

1,227,174. May 22, 1917. **Aluminum Alloy and in Articles Made Therefrom.** A. W. Morris, Springfield, Mass.

This invention relates to an aluminum alloy and to castings or forgings made therefrom, the object of the invention being to provide an alloy which will permit of the full chilling effect of the mold or die, will reduce the shrinkage of the castings or forgings, overcome the danger of cracking of the same, and increase their density, tensile strength and elongation properties as compared with those produced from the aluminum alloys, which are in use at the present time.

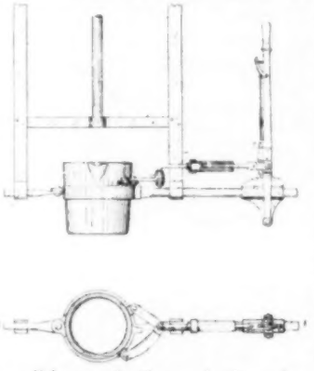
This object is attained by adding iron to the alloy as hereinafter set forth. The alloy may consist of aluminum and iron alone, or it may contain other metals such as zinc, copper, nickel, cadmium, magnesium, manganese, or one or more of these metals, besides the aluminum and iron.

Where the alloy contains also another metal or other metals, the percentage of aluminum should not be less than 70 per cent. of the whole, and the percentage of iron should not be less than 1 per cent. or more than 6 per cent. Care should be taken to keep the silicon content as low as possible.

1,226,653. May 22, 1917. **Crucible Holder.** M. W. Goldberg, Milwaukee, Wis.

The invention relates to ladle-holders.

The invention is designed more particularly to provide a holder for crucibles whereby said holder may be made to engage the crucible and may be operated to turn it to pour the molten metal therefrom.



The present invention is designed to obviate the usual difficulties encountered in foundries by providing a crucible or ladle-holder or carrier, as shown in cut, in which the circular band is made in sections forming clamping jaws which may be spread apart to go over the top of the crucible or ladle and then be drawn together around the crucible by one man, after which the hoisting and ladle conveying mechanism may be connected to the arms of the holder for transporting the crucible or ladle to the desired place, and one form of my invention provides a construction in which the holder may be lowered into the furnaces and the crucible removed therefrom by the conveyer mechanism under the control of a single operator.

1,227,569. May 29, 1917. **Nickel-Silver-Alloy Products and Process of Manufacture.** Rasmus Beck, of Düren, Germany, assignor to the firm of Dürener Metallwerke Aktien-Gesellschaft, of Düren, Germany.

This invention relates to rolled, drawn, extruded, stamped or forged products of nickel silver. For this purpose a nickel silver alloy, that is to say a zinc-copper-nickel alloy, of special composition is used which is distinguished from other nickel silver alloys by its property of allowing working at red heat, and from such alloy the products are manufactured by working the metal at red heat at least during a large part of the working processes.

The alloy composition which is suited for the purpose is a composition comprising besides 40 to 50% of zinc about 10% of nickel whereas the rest is formed entirely or mostly from copper.

However, nickel may be replaced in small parts by other metals which, like nickel, may be designated as white metals, such as cobalt, manganese, iron, aluminum, tin, magnesium and lead according to the qualities required from the manufactured products, the total contents in copper, nickel, and such other metals again amounting to 50-60%.

1,227,573. May 29, 1917. **Method of Making Castings.** W. A. Bole, Pittsburgh, Pa.

This patent covers:

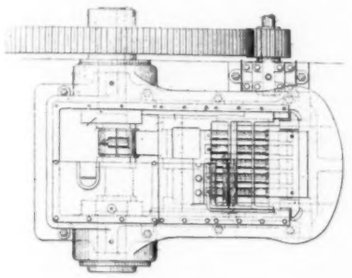
1. The method of preventing the absorption of oxygen by molten metal during the operation of casting the metal, which con-

sists in filling the mold space with an excess of relatively heavy dry gaseous products of combustion, in submerging the pouring hole of the mold with dry gaseous products of combustion, and then pouring the molten metal to be cast through the gaseous atmosphere above the mold and into the mold.

2. The method of preventing absorption of oxygen during the operation of casting, which consists in filling the mold with an excess of inert dry gaseous products of combustion in such quantities that the pouring hole communicating with the upper end of the mold is maintained submerged by the inert gas, and then in pouring the metal to be cast into the mold through the pouring hole.

1,227,831. May 29, 1917. **Briqueting-Machine.** G. W. Rigby, Pittsburgh, Pa., assignor to Isaac Weil of the same place.

This invention relates to molding machines, and has special reference to what are known as "briqueting machines" for making briquets from granular or pulverulent fuel preparatory to burning the same or from finely divided or pulverized ores or minerals preparatory to smelting the same or from other semi-plastic materials and for similar uses.



The object of the invention is to provide a cheap, simple and efficient molding machine, as shown in cut, for these purposes which will contain few parts, will be positive in its action, will not be liable to get out of order easily and one in which the parts can be easily taken out for repairing, change or renewal, as well as one providing for the proper adjustment of the parts, great strength, and one with all the working parts contained within the frame of the machine.

1,228,017. May 29, 1917. **Copper-Lead-Alloy.** E. D. Gleason, Asbury Park, N. J., assignor to New Metals and Process Company, Brooklyn, N. Y.

The patent covers:

The process of making a composition consisting principally of copper and lead; which consists in fusing copper and, while maintaining it at a temperature above its fusing point, gradually adding an equal quantity of lead and, when the mixture is liquid throughout its mass, adding a mixture formed by fusing three per cent. of fluorid of sodium and aluminum and two per cent. of manganese oxid.

The process of making a composition consisting principally of copper and lead; which consists in mixing, at fusing temperature, copper, lead, a manganese derivative, and a fluorin derivative.

The process of making a composition consisting principally of copper and lead; which consists in fusing copper and, while maintaining it at fusing temperature, adding lead and, when the mixture is liquid, adding a mixture formed by fusing fluorid of sodium and aluminum and manganese oxid.

1,228,119. May 29, 1917. **Process of Treating Aluminum Skimmings, Screenings, Dross, Slags, or Analogous Aluminous Materials.** James Wright Lawrie, of Milwaukee, Wis., assignor, by Mesne Assignments, to William F. Jobbins, Incorporated, of Aurora, Illinois, a Corporation of Illinois.

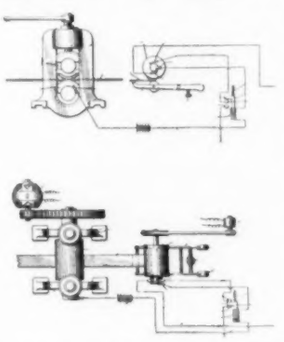
This invention relates to a process of treating aluminum skimmings, screenings, dross, slags or analogous aluminous materials for the purpose of producing therefrom certain valuable and useful products.

From the skimmings or analogous materials the larger amounts of free aluminum or its alloys are separated, if desired, by suitable means. This treatment leaves a residue consisting chiefly of the oxid, the carbids and the nitrids of aluminum, and contains also the following: compounds of iron, of copper and of zinc, and free carbon in relatively large amounts; free, finely divided aluminum and its alloys and other free metals in smaller amounts; and varying proportions of soluble salts and other impurities. This residue is treated for the production of an aluminate solution by methods somewhat similar to those hitherto employed for the manufacture of this product from bauxite and other alumina-bearing minerals or nitrids of aluminum obtained from these minerals, but differing from these methods in order to avoid the difficulties in treatment due to the impurities found in these skimmings or analogous materials, which impurities are not contained in the other sources of alumina above mentioned, and to utilize as completely as possible those substances contained as impurities but from which valuable products can be obtained.

The next step in the process is in the preparation of an aluminate solution by one of the two following methods: (1) by treating the materials, suitably prepared as described above, with a solution of an alkaline caustic, preferably sodium hydroxid, or (2) by fusion with an alkaline carbonate or an alkaline hydroxid and subsequently leaching the fused mass with water.

1,229,357. June 12, 1917. **Apparatus for Coiling Metals.** William R. Webster, of Bridgeport, Connecticut, assignor to Bridgeport Brass Company, of Bridgeport, Connecticut, a corporation of Connecticut.

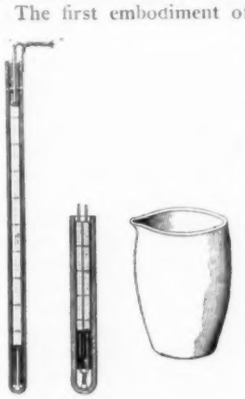
The primary object of the present invention is to provide a new method of coiling metal from the rolls which is very safe, simple and efficient, and which is applicable to the coiling of non-magnetic as well as magnetic material. It is also aimed to furnish a blocker for carrying out the improved method, which blocker is of comparatively simple, inexpensive construction. The improved blocker shown in cut, is of the electro-magnetic type, the drum or block proper being provided with a magnet or magnets which may be energized at the proper time to cause the material to be held against the surface of the rotating drum or block so as to be coiled thereon. The block or drum can be magnetized and demagnetized by the operation of a suitable electric switch, and it is not necessary for the operative to place his hands in dangerous proximity to the block.



1,229,770. June 12, 1917. **Metal Utensils.** Albert L. Marsh, of Detroit, Michigan, assignor to Hoskins Manufacturing Company, of Detroit, Michigan, a corporation of Michigan.

This invention relates to certain new and useful improvements in a metal utensil of the character which is exposed in use to the destructive action of molten brasses, bronzes and the like.

The first embodiment of the present invention in a concrete structure is that illustrated in the cut, where is shown an ordinary thermo-couple protecting tube formed of the preferred alloy, a thermo-couple of the ordinary form being located within the same. This protecting tube can be partially immersed in a bath of molten brass for long periods of time without serious disintegration and affords the first commercial and successful means for applying the thermo-couple measurements to brass melting.



The alloy found to be satisfactory for this pyrometer is composed of iron, chromium approximately 25 per cent and approximately 2 per cent manganese.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

A NEW POLISHING AND BUFFING MACHINE

An automatic machine for polishing or buffing any style of circular or cylindrical work has been placed on the market by the Chase Turbine Manufacturing Company, Orange, Mass. It is a universal machine and can also be employed for cylindrical, face, surface and angular polishing or buffing, thus, it is pointed out, adapting it for a large variety of work, such as oval and square faced bells, electric lights fixture canopies, cylindrical shaped metal bottles, cups, etc. The machine is built in two styles with vertical and horizontal work heads, which can be swiveled to bring the work into any desired position with relation to the wheels. It is also possible to revolve the work either with or against the wheel as desired, and automatic expansion chucks with a quick releasing feature are relied upon to give rapid production.

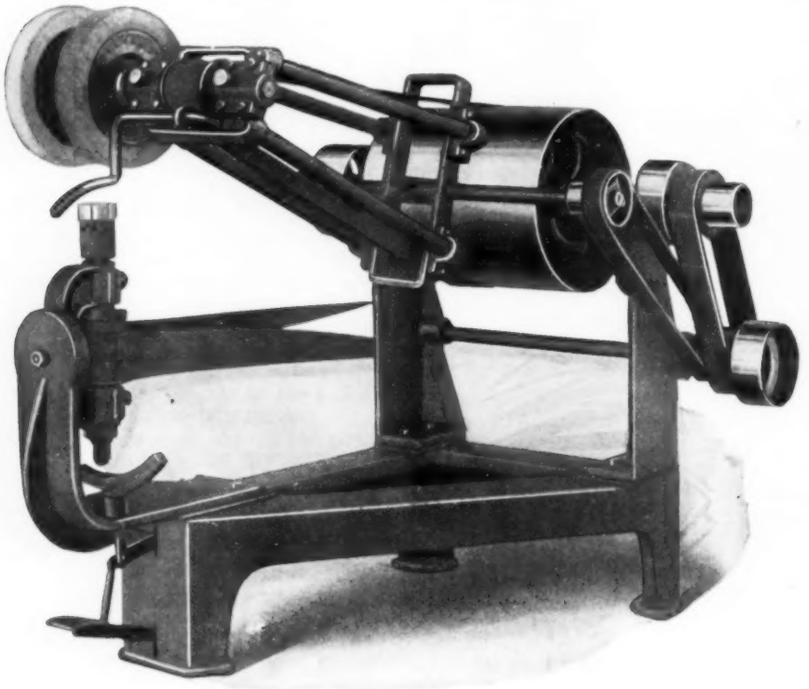


FIG. 1. THE VERTICAL HEAD AUTOMATIC POLISHING AND BUFFING MACHINE.

The vertical head machine, shown in Fig. 1, is adapted for handling round flat surfaces, while the horizontal head machine is employed for cylindrical work. The base and the sub-members are separate castings, all parts being reinforced by heavy ribs where needed. The wheel spindle is made of steel 1½ inches in diameter, and is held in place in yoke boxes. Two wheels and three spacing collars are provided for the spindle to enable three wheels having a face width of 2 inches each to be mounted on the spindle at once. In this way, it is pointed out, a cutting, a polishing and coloring wheel can be carried on the spindle at the same time, thus eliminating three handlings of the work by the operator, as when the work is once mounted in the chuck the three wheels are applied in quick succession, and the work when removed is ready for the plater. The wheels are held firmly in place, it being emphasized that the only motion permitted is from left to right, or in the opposite direction, at the will of the operator.

The work head, details of which are given in the accompanying, Fig. 2, can be swiveled on its support to bring the work into any desired position with relation to the cutting wheels. The revolution of the work can be stopped by a movement of the foot treadle which applies the brake and also releases the automatic expanding chuck employed. The work head is supported by the bracket A and the spindle B extends entirely through the head. It is driven by the pulley C, which has a long hub running into the lower bearing. Normally the clutch member D is held in engagement with the clutch face of the pulley by the spring at the right. The housing surrounding the clutch serves as a brake and dust hood.

In the drawing a shell is being polished and is held by the expanding chuck body E, which is expanded by F. The expander is fastened to the rod G, which extends through the spindle, by a hollow hexagon fillister head screw. The lever H, which is operated from the plunger I through the rod J, actuates the rod G. The plunger receives its motion from the foot treadle through a connecting rod and the levers K and L. When the treadle is operated the rod G is moved to the left, forcing the expander F out of the chuck body E, and freeing the work. At the same time the collar M on the rod comes in contact with the bottom of the spindle B, and carries the clutch D away from the pulley and against the clutch housing, thus stopping the spindle. The finished work is then replaced with a new piece and the foot removed from the treadle. The spring at the right draws in the rod G, thus expanding the chuck and pulling the clutch D against the pulley C, and starting the spindle. If desired, a solid contractor and a split chuck can be substituted for the arrangement shown, thus enabling work that can be held by the outside to be finished.

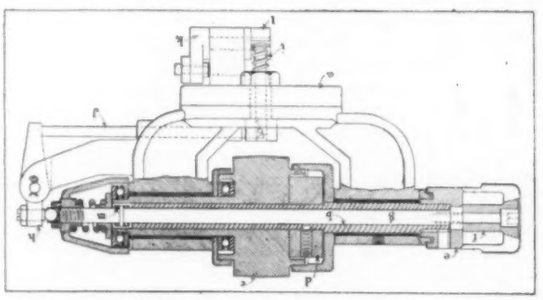


FIG. 2. THE WORK BEING FINISHED IS MOUNTED ON AN EXPANDING CHUCK WHICH IS OPERATED BY A ROD EXTENDING ENTIRELY THROUGH THE SPINDLE OF THE WORK HOLDING HEAD.

The machine is driven from a countershaft or the main lineshaft by a belt connection to a pulley 10 inches in diameter with a 5-inch face. This pulley is regularly fitted to the left end of a 1 7/16-inch shaft looking toward the machine. A sliding movement of 16 inches to the wheel spindle is provided by a drum pulley 18 inches in diameter, with a 20-inch face.

HAUSFELD METAL MELTING FURNACE

The furnace shown in the cuts is of the open flame type, and was designed for the melting of brass and such metals having copper as their basic element. The use of crucibles is entirely dispensed with.

Gas or fuel oil may be used. Both the gas and oil burners as designed by us insure a uniformly distributed heat of proper temperature. The metal is melted by reflected heat from the walls of the furnace, and not by the flame coming in direct contact with the metal. This method is similar in principal to that of melting in a crucible.

The furnace is designed to hold 400 pounds of metal, but

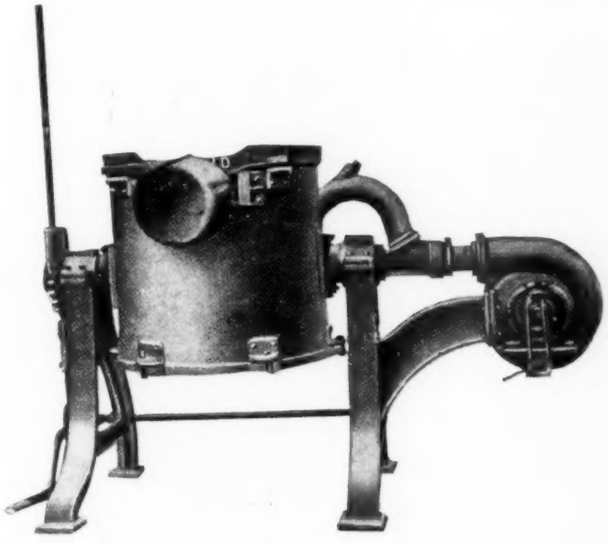


FIG. 1. HAUSFELD FURNACE READY FOR CHARGING.

for light castings where intense heat is necessary, best results are obtained by melting not over 300 pounds per heat. From 9 to 12 heats can be run every 9 hours for the ordinary brass mixture.

The lining is made of the very best refractory brick obtainable, and has interlocking points through which the metal cannot seep. Relining requires but very little time, because of the plain shape of the drum and the ease with which the brick can be fitted.

The linings do not slag, but in wearing may be compared to that of a crucible which scales, and consequently insures greater longevity.

While over 150 heats have been obtained from a lining, nevertheless care should be taken that the lining is not worn beyond a certain thickness as the retention of the heat will decrease, and consequently the efficiency of the furnace is lessened.

A new set of linings consists of one top, one bottom and 65 interlocking brick with 50 pounds of cement. Shipping weight is 665 pounds.

DIRECTIONS FOR OPERATING.

A new set of linings should be thoroughly heated, then allowed to cool in order to obtain a glazed surface, thereby prolonging the life of the linings. It is at all times extremely important to have the furnace thoroughly heated before charge is made. While the blast is on, place the entire charge of metal on top of the drum and push it into the hole as fast as the furnace will take it.

When charged, turn the drum forward with the pouring hole downward as far as possible without permitting the metal to run from pouring hole. Leave in this position until the metal is entirely melted, then tilt furnace to the opposite horizontal position as far as it will go. Leave in this position until the upper half of the furnace becomes thoroughly heated, then tilt the furnace forward again as far as possible without spilling the metal. In doing this 3 or 4 times the metal should be ready for pouring. Do not permit furnace to stand in vertical position when melting.

It is very important that the furnace be kept free from slag and material. Several handfuls of fine charcoal or any good cleaner should be thrown in furnace immediately after the metal is removed, and all slag and contents should be removed before another charge is made. Care at all times must be taken to see that the furnace is kept thoroughly clean. Inspect the burner daily and keep the opening clean. If necessary patch around the burner with fire clay in order to preserve it. Air gauges on oil furnaces should register 12 ounces when the furnace is in operation. The oil pressure at pump should be 30 pounds. A record of tests of this furnace made in 20 heats shows the following:

Total amount of metal charged in 20 heats	6,751 lbs.
Total amount of metal recovered in 20 heats	6,658 lbs.
Loss	93 lbs.
or Average	1.37%
Average time per heat	45 minutes
Average gas consumption per 100 lbs. of metal	250 cubic ft.

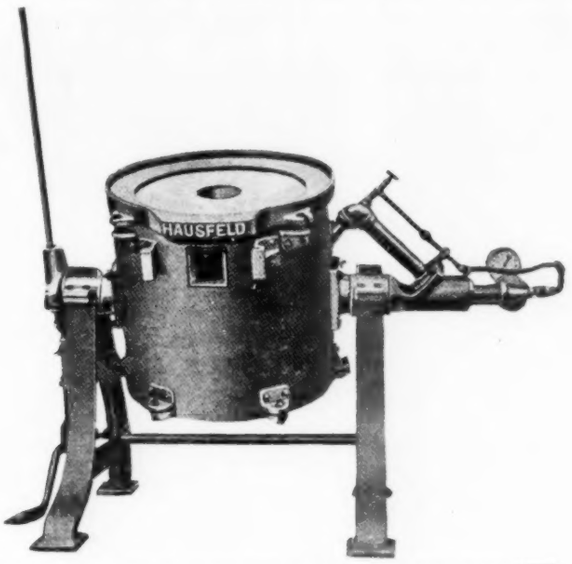


FIG. 2. HAUSFELD FURNACE EQUIPPED FOR FUEL OIL.

The furnace is manufactured by the Hausfeld Vibrator & Equipment Company, Cincinnati, Ohio, who issue a booklet giving full information.

THE STRANGE PRICE ADVENTURES OF PHOSPHORIZED TIN AND COPPER

We wonder whether users of phosphor tin and phosphor copper have observed the shift in price comparisons of these two alloys. And if they have, whether they have taken advantage of these changes.

Of the many unique situations into which the war has forced metals few have been so radically changed in price relations as phosphor tin and phosphor copper. A year ago, the former ruled about 17 cents higher in price than the latter. Six months ago the difference in price was about 11 cents, while today the prices of both are about the same.

This peculiar situation is making a great change in reducing the volume of phosphor copper business, and proportionately increasing that of phosphor tin. When the prices ruled normal, and the price of phosphor copper was considerably lower than that of phosphor tin, a good many foundries gave preference to phosphor copper because of its lower price, feeling that the better results attained with phosphor tin did not warrant the higher cost. But with the prices now nearly equal, phosphor tin is, of course, being given the preference when it is known to be better adapted to the work.

The Syracuse Smelting Works of Brooklyn, N. Y., who

manufacture the well-known Stanley process alloys, have recently published pamphlets describing the properties of their phosphor tin and copper. In one of these pamphlets they advise that an excellent phosphor bronze may be made of 85 per cent. copper and 15 per cent. Stanley process phosphor tin, or 85 per cent. copper, 10 per cent. Stanley process phosphor tin and 5 per cent. lead.

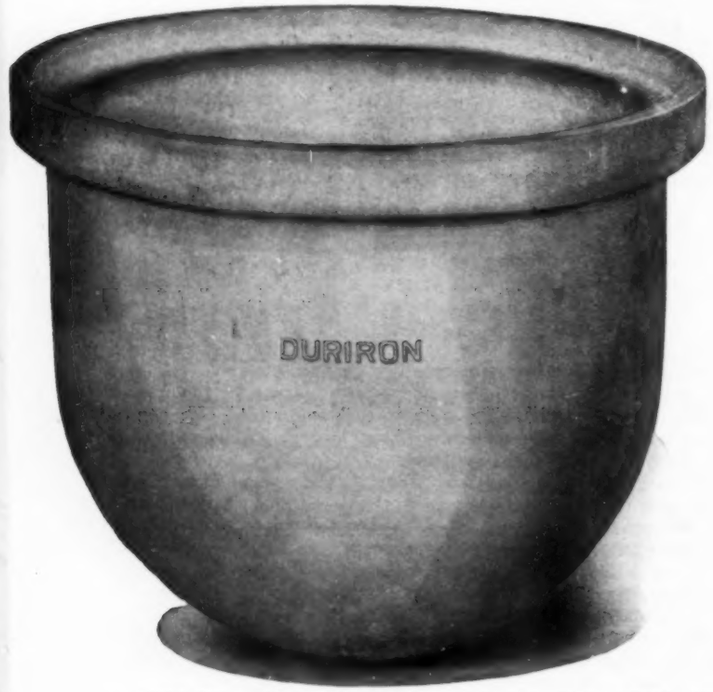
NON-CORROSIVE METAL

The apparatus shown in the cuts, the laboratory sink and the kettle with the bell top, are made of Duriron and which are manufactured by the Duriron Casting Company, Dayton, Ohio. Duriron is an alloy of extremely hard and close grain, showing a white fracture, taking and retaining a better polish, it is claimed, than nickel.

A DURIRON LABORATORY SINK.

Some of the particular advantages of Duriron claimed by the manufacturers are its successful resistance to acid and alkaline solutions. In support of this claim, the following table is given which shows the resistivity to corrosion possessed by Duriron under some severe time tests:

Solution.	Duration of Test.	Results.
25% Sulphuric Acid	One year	No loss
25% Nitric Acid	One year	11/1000 of 1% loss
10% Hydrochloric Acid	30 days	3/10 of 1% loss
Glacial Acetic Acid	Heated 120 hrs., under pressure	No loss or discoloration
Ammonia (17% NH_3)	Two months	No loss
Sodium Chloride	72 hours	No loss
Calcium Chloride	72 hours	No loss



A DURIRON BELL-TOP BOILING KETTLE FOR ACIDS OR ALKALIES.

It is further claimed that Duriron will not soften materially or lose its shape at a temperature much below its melting point, which is about 2500 degrees Fahrenheit. It is very fluid in the molten state, permitting pouring into very thin sections when desirable and it shows practically no oxidation at even the highest temperatures. Among the physical properties of Duriron are the following:

Specific gravity	7.00.
Weight per cubic inch	0.253 pounds.
Tensile strength	10,000 to 12,000 pounds per square inch.
Transverse strength	1,000 pounds with a deflection of between 1/16 and ⅛ inch.
Compression strength	70,000 pounds per square inch.
Melting point	2,500 degrees Fahrenheit.
Coefficient of expansion	.00001565 per degree Fahrenheit.
Electrical conductivity	1/40 that of standard annealed copper.
Contraction allowance in casting	3/16 inch per foot.

A very complete story of this remarkable material together with illustrations as to the very wide range of application to which the material is adapted is to be found in Bulletin No. 100 issued by the Duriron Casting Company and which may be had upon request.

AN ELECTRIC BENCH LAMP

The new electric bench lamp, here illustrated, is one that is meant to displace the gooseneck and drop-light system of lighting the work bench. The lamp is made with a joint which is adjusted with a wing-nut in any desired position and when so set cannot work loose or limber up as is the case with the goose-neck. On the other hand, the drop-light will not stay rigid and is therefore in disfavor. This new lamp being rigid, when set will throw the light on the work and the shade protects the worker's eyes however close he may come to the lamp. Since the lamp was first introduced it has met with great favor, filling as it does a long felt want. Being small and compact, it is quickly put away when not required. The lamps are manufactured and supplied to the trade by Leiman Bros., Jewelers' Machinery Manufacturers, 62 John Street, New York.

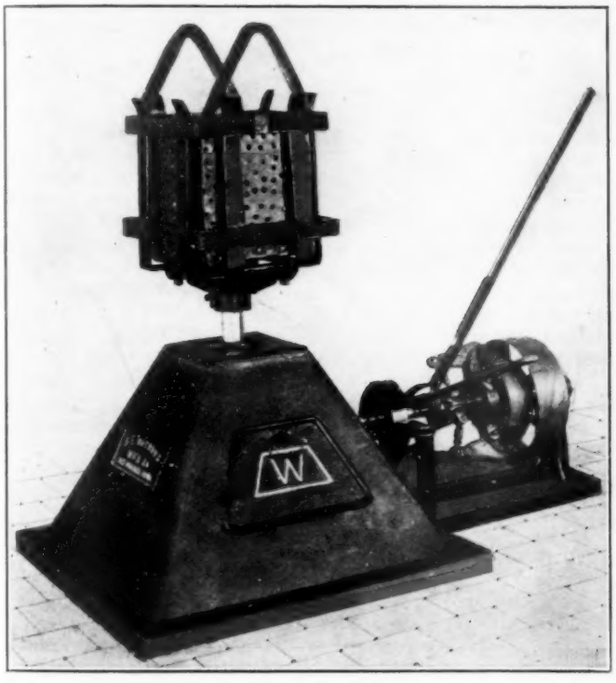
LEIMAN BROTHERS ELECTRIC BENCH LAMP.

NEW GALVANIZING MACHINE

The machine shown in the cut is the invention of E. L. Watrous, of Des Moines, Ia., and is the result of a need for a galvanizing process whereby a smooth coat of zinc could be given to intricate castings of iron used in washing machines.

The machine is very simple. It consists of a heavy frame 16 inches square by 12 deep, with a self-locking lid, bolted to the top of an upright shaft, with means for revolving this shaft at a high rate of speed. It is equipped with a friction clutch and a brake. Only the frame is above the floor level; the base containing gears and mechanism, as well as belts running to electric motor, are in pits below the floor level, these being covered over. A sheet iron jacket surrounds the frame to catch the flying zinc.

The work to be galvanized is placed loosely in a basket made of wire or perforated steel, about 50 or 100 pounds to the charge. Two men lift the basket by means of a piece of pipe run through the handles, and lower it into the kettle. When the contents are sufficiently cooked, the basket is lifted out and quickly transferred to the machine; one man pulls out the pipe and the



THE WATROUS GALVANIZING MACHINE.

other slams down the lid and throws on the power. The machine takes about three seconds to get up to its speed of 400 revolutions per minute, and the surplus zinc flies out like snow through the spaces in the basket, is caught against the jacket and falls to the floor, whence it may be picked up and used over again. In about 10 seconds the surplus will have been removed; the operator steps on the brake, stops the machine, lifts out the basket and dumps the contents on the floor for cooling. The machine will handle on an average about 150 baskets per hour.

Different sized and shaped heads and baskets may be used on this machine, one having been built to handle work four feet long. The greatest use of this machine, however, is on small castings or steel stampings, rivets, tacks, nails and especially bolts and wood screws. These can be galvanized so smoothly that the nuts will go on the bolts without re-cutting the threads, and yet they will stand four times the United States Government test for galvanizing.

The greatest value of this process, however, is said to be in its cheapness. It saves from 50 to 70 per cent. of the zinc that would be put on in hand dipping, and this surplus, if allowed to remain, would be an actual detriment to the work, as it is in the shape of lumps and drips and rough spots. It also saves tremendously on labor and all other expenses.

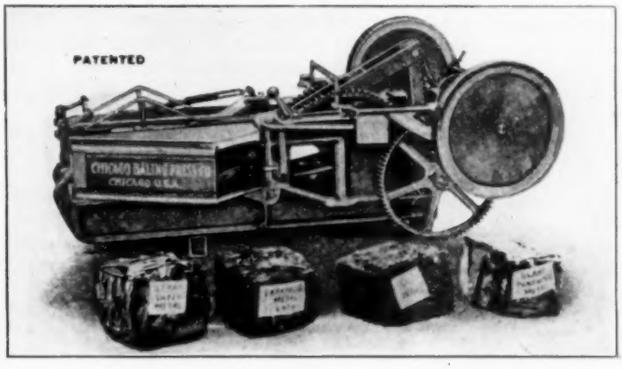
The inventor claims for this process that it will produce cleaner, smoother work than any other method of hot galvanizing, that it will stand four times the standard tests for galvanized material, and that its total cost, including royalties, is only from 30 to 50 per cent. of that of the ordinary hot dip method.

The machines are put out on a royalty basis at cost, and royalties are charged of 5 cents per hundred pounds on nails, tacks and rivets; 20 cents per hundred pounds on screw-threaded articles, and 10 cents per hundred pounds on all other articles. Further information may be had from the C. L. Watrous Galvanizing Company, Des Moines, Ia.

NEW SCRAP METAL PRESS

The press shown in the cut is now being manufactured by the Chicago Baling Press Company, Chicago, Ill., and is known as the New Standard Press. This press is designed for use in bushelling or cabbaging scrap material of all kinds in order to put it into a compact shape, and thus avoid the loss in melting, and also to admit of more ecnomical handling. The press is driven by belt power from a line shaft, but is so self-contained that it can be placed anywhere, requiring a floor space of about five by eight feet in extent.

The press is provided with tight and loose pulleys—4-inch face, 12-inch diameter, and should run from 450 to 500 r. p. m.



SHEET METAL SCRAP-BALING AND CRUCIBLE-CHARGE PACKING PRESS.

It requires about 5 h.p. when in the act of pressing. Fitted with friction clutches, which places it under control of the operator, who instantly starts and stops it at will, independent of the source of power.

The press is simple in operation. The belt is shifted by the belt shifter from the loose to the tight pulley, which sets the flywheels in motion, and the press is ready for work. By releasing the top, which is done by a turn of the eccentric handle, the top being counterbalanced, will instantly open, ready to receive a charge. When the press-box is filled, the top is shut down and by the crank lever the press is instantly set in motion, and in a few seconds the pressing is done. The bushel is then taken out and stacked and the operation repeated, so that the work goes on, making a bushel or block every few minutes.

This press can also be run by electric motor, and is portable so that it can be moved from one part of the shop to another, and material can be more economically handled right where it is wanted.

The company has perfected another press for the cabbageing or baling of scrap metal which they call the New Wonder press. This press is geared back twice and double, and uses the toggle movement means of power, which is known to be the greatest mechanical means of producing power that there is using two heavy fly wheels running at high speed. Catalogues giving full descriptions and illustrations of these and numerous other presses are issued by the manufacturers, The Chicago Baling Press Company, 305 S. La Salle street, Chicago, Ill., who will be glad to furnish them upon request.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN ELECTRO-PLATERS' SOCIETY CONVENTION

The convention held at St. Louis, Mo., July 5, 6, 7, was declared to be the best ever held. What some of the prominent platers thought of it is given below:

Charles H. Proctor, The Roessler & Hasslacher Chemical Company, New York.—

"The fifth annual convention of the American Electro Platers' Society is the most successful that has ever been held, not only from the standpoint of attendance from different parts of the country, but the splendid exhibits that were shown at the convention demonstrated to the society that St. Louis stands in the first rank of finished products, more especially the stove industry. I extend to them my congratulations on the splendid exhibit they have made, which proves that they do stand first in the stove industry throughout the world. The splendid democratic feeling that was shown at the convention proves that democracy is the only foundation upon which any organization or nation should exist. As founder of the American Electro Platers' Society, I realize that my efforts in the early years of its history have not been in vain. The splendid efforts of my collaborators have made the American Electro Platers' Society what it is today—one of the foremost industrial and technical societies in this country. The future of the society rests with its members. The motto of the society is: 'Knowledge Is Power.' Let us apply that knowledge to the best interests of the society during the coming year and the years to come, and the A. E. S. will not have been in vain, proving that its birth was a star in the commercial history of the nation. In the trying times of our country, I am sure that the members, each and every one, pledge their loyalty to the country and the flag, and will do everything within their power to co-operate with the government to promote democracy throughout the world, and through the efforts of the United States shall bring a lasting peace, which shall unite the nations of the earth into one common band of fraternalism, which shall eventually bring the peace that has been promised to us through Divine revelations. Let us hope the time is near when that peace will come."

R. H. Sliter, Celluloid Zapon Company, Cleveland, Ohio.—

"This convention is a bigger success in every way than any we have ever held. The attendance is greater, and the exhibits are far superior. Such gatherings as these are bound to be productive of much good to the members of the society." Mr. Sliter is one of the most popular members of the society.

Edward L'Hommedieu, Charles F. L'Hommedieu & Sons Co., Chicago, Ill.—

"The combining of the business, educational and entertainment features of the convention in a boat ride on the Mississippi is a unique experience, and I enjoyed it thoroughly. This has been a thoroughly enjoyable meeting to me."

H. H. Williams, of St. Louis, retiring president of the American Electro-Platers' Society.—

"The great interest manifested in the convention proves that it is of great value to the active workers of our society. The size of the attendance shows that it made no mistake in coming to St. Louis. The local committee feels amply repaid for the efforts they put forth by the kind expressions of those who attended."

A. P. Munning, President Munning-Loeb Co., Matawau, N. J.—

"This is the best convention ever held by the society. The character of the papers read and the caliber of the men present were splendid. The attendance was remarkable in view of the fact that it was held so far west in midsummer. The whole convention was extremely happy, due to the courtesy with which the St. Louis delegates and their associates handled the business arrangements and entertainment features."

THE EXHIBITORS.

Both as to number and variety of displays the exhibits were greater than at any previous convention of the association. These exhibits were regarded as one of the most important parts of the educational features of the convention, and attracted considerable attention. The men at the various booths were kept busy answering questions, and the greatest possible interest was evinced in the display. The exhibitors included the following:

Charles F. L'Hommedieu & Sons Co., Chicago, Ill.—Ball bearing lathe and utility hub and canvas wheels, also a general line of compositions and rheostats.

Matchless Metal Polish Co., New York and Chicago.—White diamond buffing composition.

Quick Meal Stove Co., St. Louis.—H. H. Williams, plater, nickel plated gas range.

National Cash Register Co., Dayton, O.—Walter Fraine, plater, cash register and samples of various wood finishers.

St. Louis Coffin Co., St. Louis.—L. Gaus, plater, copper plated steel casket.

Frank Adam Electric Co., St. Louis.—P. Tressider, plater, exhibit of plating.

Charles Fischer, St. Louis.—Nickel-plated surgical instruments.

American Car & Foundry Co., Detroit, Mich.—C. W. Cunningham, plater, nickel-plated stove parts and photographs showing the galvanizing of buoys and mines.

Koken Barbers' Supply Co., St. Louis.—H. J. Richards, plater, three nickel-plated barbers' chairs.

Buck's Stove & Range Co., St. Louis.—T. F. Carson plater, blue enamel and nickel-plated stove.

Climax Machinery Co., Indianapolis, Ind.—Dick Hennessy, plater, nickel-plated slicing machine.

Oakley Chemical Co., New York.—Display of the various Oakite products, with photographs magnified 1,000 times showing oil emulsified by Oakite and oil saponified by caustic.

Charter Oak Stove Co., St. Louis.—F. C. Rushton, plater, nickel-plated and enameled stove.

Musick's Plating Works, St. Louis.—All steel flag made by E. J. Musick, red stripes copper plated, white stripes silver plated, stars nickel plated; field, blue steel. Another feature of the exhibit was a model of the Musick Plating Works, one-twelfth actual size, which was made by J. H. Hartman, foreman plater, during his spare time in the evenings, two weeks being required. The first water cooled generator used west of the Mississippi manufactured in 1877, and used by Musick's in 1880 and 1882, also was shown and attracted considerable attention.

Mueller Plating Co., St. Louis.—Gold-plated candelabra.

Tuttle & Bailey, New York.—Edward T. Lawrence, plater, plated cast iron registers for hot air furnaces.

J. F. Mergott Co., Newark, N. Y.—Watts, plater, advertising novelties.

W. A. Fuller Co., Greensburg, Pa.—Display of Natrolin, cleaning material.

Quality Stove & Range Co., Belleville, Ill.—C. J. Koderhandt, plater, blue enamel and nickel coal range.

Ideal Stencil Machine Co., Belleville, Ill.—Stencil machine.

Frederick B. Stevens, Detroit, Mich.—Electric plating equipment, with full working model, and full line of chemicals, felt wheels, bull neck wheels, sheep skin wheels, compressed linen wheels and various lines of cleaners.

Auto Stove Works, New Athens, Ill.—M. Hoffmeister, plater, nickel and white enamel stove.

J. B. Ford Co., Wyandotte, Mich.—Display of Wyandotte cleaners for cleaning metals and metal articles for plating, japanning, galvanizing, handling, assembling and inspection.

Roessler & Hasslacher Chemical Co., New York.—Display of

metal cyanides for plating solutions—copper cyanide, zinc cyanide and silver cyanide.

Arcade Mfg. Co., Freeport, Ill.—L. E. Shaw, plater, nickel-plated refrigerator hinges and handles.

Bridge & Beach Mfg. Co.—John T. McCarthy, plater, nickel and blue enamel stove range, nickel plated gas water heater and nickel plated stove.

Majestic Stove & Range Co.—George Lamkemeyer, plater, nickel-plated coffee urn, and child's range and stove legs.

Oneida Community, Sherrill, N. Y.—F. C. Mesle, plating engineer, 36 pieces of silver plate.

Ontario Silver Co., Muncie, Ind.—William Wright, plater, evolution board showing knives and forks, silver plated.

H. E. Willmore, Chicago, Ill.—Exhibit of finishes on hardware fixtures.

J. A. Stremel, New York.—Harvey Miller, plater, samples of nickel plating.

Parker Rust Proof Co. of America, Detroit, Mich.—Parker Rust Proof process perfected by Clark W. Parker.

Wagner Electric Co.—H. Duebelbeiss, plater, samples of nickel and brass plating.

The Prest-O-Lite Co., Indianapolis, Ind.—Oxy-Acetylene welding and cutting.

Enterprise Manufacturing Co., Akron, O.—H. J. Ter Doest, plater, 50 samples of electrotypes plated in different finishes, harness ornaments, reel work and fishing tackle in one to four colors.

Crown Rheostat & Supply Co., Chicago, Ill.—Crown rheostats, Maximus electro-plating dynamos..

E. J. Woodison Co., Detroit, Mich.—Woodison quality compositions and Roto-plater, the simplified plating barrel.

Dayton Engineering Laboratories Co., Dayton, O.—A. Barrow, plater, nickel-plated generator.

McGill Mfg. Co., Valparaiso, Ind.—Samples of plating of copper, gun metal and nickel.

H. F. Barrows & Co., North Attleboro, Mass.—J. Douglas, plater, gold-plated jewelry.

Ford Motor Co., Detroit, Mich.—H. S. Brockway, foreman, and J. Flanagan, G. Kutzen, D. Miller, L. P. Brockway, H. Gardner and C. Phillips, platers, nickel, copper and brass auto parts.

C. M. Hall, Kenosha, Wis.—C. C. Martel, plater, nickel-plated cycle and auto lamps.

American Can Co., Detroit.—A. J. Fritz, plater, brass plates.

Edmond & Jones, Detroit.—E. G. Lovering, plater, steel reflector, copper and silver plated.

Cadillac Motor Co., Detroit, Mich.—E. Woodmansee, plater, nickel-plated stove trimings.

Ireland, Matthews & Co.—Whitmore, plater, stove urn nickel and copper plated.

Capital Brass Works.—Hartz, plater, brass valve cock.

AMERICAN SOCIETY FOR TESTING MATERIALS

This society held its annual meeting in Atlantic City, N. J., June 26 to 29. A number of interesting features developed at this meeting, the first of which was the report of a new committee as a result of a motion at the last annual meeting to study the question of standardizing magnifications for work with the microscope. The committee offered a tentative list of definitions and rules. These stipulate that the standardized magnifications for making micrographs of steel and ferrous materials shall be 50, 100, 250 and 500, with 100 diameters as the size for general use in the society reports and for showing grain size, and for making micrographs of non-ferrous metals the magnifications shall be 25, 75, 150 and 250, with a magnification of 75 diameters for general use in the society reports and for showing grain sizes of copper and copper alloys.

Officers for next year were elected as follows:

President, Gen. W. H. Bixby, brigadier general of the United States Army, retired, Washington, D. C.

Vice-president, Prof. Edwin Orton, Jr., dean of the College of Engineering, Ohio State University, Columbus.

Members of the executive committee: J. A. Capp, chief of the testing laboratory, General Electric Company, Schenectady, N. Y.; Dr. W. F. M. Goss, University of Illinois, Urbana, Ill.; W. M. Kinney, inspecting engineer, Universal Portland Cement Company, and C. D. Young, engineer of tests, Pennsylvania Railroad, Altoona, Pa.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

George B. Hogaboom, formerly foreman plater with the International Silver Company, Meriden, Conn., has joined the research forces of the Scovill Manufacturing Company, Waterbury, Conn.

R. A. Wood, the well-known brass and copper rolling mill expert and author of "The Waterbury Book of Alloys" is now engaged in installing a sheet zinc rolling mill for the New Jersey Zinc Company at Palmerton, Pa.

T. C. Eichstaedt, a well-known electro-plater and member of the Detroit Branch of the American Electro-Platers' Society, is now demonstrator of Carlsruhe cleaning compound for the James H. Rhodes Company, 162 William street, New York.

DEATHS

Frederick C. Grant, a chemist and New York manager of the Grasselli Chemical Company, whose main office is at Cleveland, Ohio, died recently at the Blackmore Sanatorium, at the age of forty-six years. Mr. Grant is survived by his wife.

JOHN BENNETT

John Bennett, vice-president of Coates, Bennett & Reidenbach, Inc., metal merchants and smelters and refiners, Rochester, N. Y., died very suddenly on Saturday, June 23. Mr. Bennett was well known in metal circles, having entered into the business over twenty years ago, passing through its various stages, beginning as an employee in the office and rising to the high position of vice-president and manager of the iron and steel department of the company.

JOHN BENNETT.

He was born in England, April 2, 1869, and came to this country in 1890.

Mr. Bennett was a member of Corinthian Temple Lodge F. & A. M., Hamilton Chapter R. A. M., Doric Council R. & S. M., Rochester Consistory of Scottish Rite Masons, Rochester Commercial Travelers M. B. A., United Commercial Travelers of America, the Rochester Club, and a number of other societies.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

JULY 9, 1917.

Perhaps one of the best ways to prove the prosperity that this city is now enjoying would be to give a brief account of some of the things that are now taking up the attention of Waterbury manufacturers.

The city is noted for the diversity of its many industries and business. Its principal industries being the manufacture of rolled and cast brass, copper and nickel silver wares, lamp trimmings, boilers, buttons, buckles, clocks, watches, plated ware, pins, eyelets, all kinds of machinery, chemicals, acids, etc.

Among the products turned out in Waterbury factories we mention the following:

The Blake & Johnson Manufacturing Co.—Machinery division, 173 North Elm street. Builders of machinery, cold rolling mills, slitters, slotters, drop, foot and sub-presses, the Waterbury grinder, rivet machines, rolling, threading four slide punching and forming machines; manufacturing division, 1492 Thomaston avenue, screws, nuts, rivets and special goods from wire, piano, organ and player hardware, screw machine products.

Charles F. Kenworthy, furnace engineer, all kinds of industrial furnaces as, for instance, those for annealing, heating, for forming, heat treating, forging, etc. Also non-oxidizing annealing furnaces for the bright annealing of non-ferrous metals. Furnace appliances, tongs, loading tables, etc.

The Waterbury Farrel Foundry & Machine Co.—Presses and special metal working machinery, including the following: Automatic nut, bolt and rivet machinery, thread rolling machines, machinery for manufacturing hinges and butts from sheet steel and brass, cartridge machinery for making metallic cases, bullets, paper shells, primers, drop presses, automatic drop hammers for forging and stamping, automatic multiple eyelet machines and attachments, foot presses and screw presses, button covering foot presses, chain draw benches for tubing and rods, tube pointers and saws, hydraulic draw benches, presses, accumulators, power pumps, valves, knuckle joint embossing presses, horizontal and special presses, lathes for burnishing, knurling, trimming and spinning sheet metal, single acting open back power presses, automatic feeds and attachments, single acting blanking and drawing presses (pillar pattern), with feeds; double acting power presses, crank, cam and toggle action presses, rolling mills for rolling sheet brass, copper, steel, tin foil, etc. Rod rolls, shear presses and plate shears, single and gang slitters and rotary trimmers, finishing machinery for sheet brass, nickel silver, etc.; straighteners, coilers, muffles, casting shops and furnaces, wire and rod drawing machinery and bull blocks.

Waterbury Buckle Co.—Buckles, metal specialties of brass and steel.

The General Manufacturing Co.—Rivets, machine screws and steel burnishing balls.

Somers Co., Inc.—Sheet brass, bronze, nickel silver, copper, oride in thin gauges.

The Kalbfleisch Corporation.—Sulphuric acids, oil of vitriol, nitric acid, aqua fortis, mixed acid, muriatic acid, electrolyte (storage battery acid), chloride of alumina, glaubers salt, salt cake, nitre cake (bisulphate of soda), lacquers and thinners.

Waterbury Standard Tool & Machine Co.—Special automatic machinery, dies and tools of every description.

Randolph & Clowes Co.—Brass, copper and bronze seamless tubing to 32 inches diameter, brass and copper seamless shells 4 inches to 32 inches diameter, sheet brass and bronze, brass and bronze rod, muntz metal sheets and rod brazed brass tubing, drawn brass and bronze channels, angles, etc.; spun brass kettles, (Brown & Brothers) seamless copper range boilers.

American Pin Co.—Pins, safety pins, hooks and eyes, gas and electric fixtures, brass bedstead trimmings, brass, bronze and aluminum castings; plumbing supplies.

BRIDGEPORT, CONN.

JULY 9, 1917.

Not a single one of the manufacturers interviewed here in Bridgeport has as yet admitted that the entrance of the United States into the European war has made the slightest difference in their business. Some of them, however, do say that they fear that the future will not be as bright, financially speaking, as the present. The draft is what they fear most, drawing as it will from all classes of men, and without doubt taking some of their best employes. They refuse to look upon matters with a pessimistic attitude though, and are still taking all the orders that come their way.

The orders are pouring into the Bridgeport concerns in numbers and quantities at the present time that probably exceed anything the manufacturers have heretofore experienced. This business is not confined to the iron or steel concerns as so many are liable to suppose, but the brass and copper manufacturers are receiving a large share of the general increase. The United States Government has within the last couple of weeks placed several large orders in local concerns for brass shells and cartridges, which will keep the companies securing the contracts busy for at least six months.

One of the indications of the increased business that has hit Bridgeport within the last few months is shown by the increased output of the Newfield Silver Company. This company is a comparatively new concern among the factories of the city, and yet they have grown by leaps and bounds since their incorporation. Only within the last week they have obtained the plant of a concern in the city which has been manufacturing lamps of all descriptions, and are to install the machinery acquired in their own plant and continue the manufacture of the lamps under their own management. The site of the purchased factory is to be sold when the removal of the machinery has been completed.

The E. H. H. Smith Silver Company, of this city, was awarded a rather unusual contract recently. The son of the late Henry Green, Col. E. H. R. Green, has contracted with them to furnish a beautiful Louis XVI silver service for his private yacht. The contract was awarded through the well known decorator, P. J. Vander Putten, of New York.

Each piece of the service is to bear a specially designed enamel crest making a work of art out of every individual article in the service. The Smith company will attempt to secure permission to exhibit the service in a local display window when finished, prior to its being sent to New York for installation aboard the yacht.—L. M. P.

NEW BRITAIN, CONN.

JULY, 9, 1917.

Since the distribution of P. & F. Corbin Annex, the plant's foundry, with a loss of about $175,000, the officials have been preparing plans to reconstruct the foundry in an entirely new location and far removed from the site of the former plant. It is planned to rebuild the foundry near Chestnut street, near the old Corbin motor vehicle plant, and already the factory has asked permission to run a spur track from the main railroad line to accommodate this new structure. In addition to rebuilding the foundry, this concern has plans for building a new, modern power plant.

At the quarterly meeting of the Landers, Frary & Clark Company a regular dividend was declared, plus an extra dividend of one per cent. Stockholders have been asked to donate this extra dividend to the Red Cross. An extra dividend has also been declared by the American Hardware Corporation, with the request that it be given to the Red Cross. The factories themselves have contributed generously to the American Red Cross.

and with their employes have also bought generously of the Liberty Loan.

Herbert Johnson, for a number of years superintendent and general manager of the North & Judd Manufacturing Company, has resigned that position and taken up his residence in Washington, where he has been appointed chairman of the hardware equipment committee of the National Defense Council.

General business conditions in New Britain are good, and all of the factories are working on regular schedule, although at the Machine Company some big orders have necessitated an increase in the working schedule in some departments.

It is currently rumored in business circles here that the Hopkins & Allen Arms Company of Norwich is in serious financial troubles. With an original working force of about 2,000 cut down to about 100 in a few weeks, it is understood that some of the directors have gone so far as to mention the possibility of bankruptcy proceedings. Rumor also has it that the Colt's Patent Arms Company may take over the concern. Nothing is official, however, except the fact that about 1,800 employes have been let go during the past few weeks. The Hopkins & Allen Arms Company has had several big war orders, included among which was one for rifles for the Belgian government.—H. R. J.

HARTFORD, CONN.

JULY 9, 1917.

That the war has taken a decided step in the development and prosperity of Hartford is shown in two big war orders recently received by the Colt Patent Firearms Manufacturing Company, of this city. The first order received during the past month was for 500,000 automatic pistols for the Government at a cost of $7,750,000, delivery to begin as soon as possible. The cost to the Government for a pistol is $14.50 each, and $1 for two extra magazines for a pistol, the total cost being $15.50. The second order received by the Colt company was one for 100,000 revolvers of the new service type, 45 caliber, and involves $1,400,000. It is for making these pistols, and especially the automatic pistols, that the Colt company is having erected an immense building to the south of the armory, built during the present war. The new building is of steel and concrete construction, over 500 feet long and 171 feet wide. It is expected that the building will be completed in July. The company is at present turning out for the Government between 400 and 500 automatic pistols a day on a previous order, but when the new building is completed it will be able to turn out 2,000 pistols a day. It is believed that the work of the Colt company will show a record of achievement in the manufacture and output of firearms not equaled in this country. The new contracts assure employment for many people for some time to come.

It is rumored about Hartford that B. M. W. Hanson, vice-president and works manager of the Pratt & Whitney Company, of this city, is about to sever his connections with that firm to join the forces of the Colt's Patent Fire Arms Manufacturing Company, also of this city. Mr. Hanson is very reticent about the matter and in a statement says: "Regarding the reports being circulated in Hartford that I will soon become connected with the Colt Patent Fire Arms Manufacturing Company, I desire to state that I am not at present prepared to give any details regarding the matter. When final arrangements have been completed I will be very glad to make a public announcement." Under the able supervision of Mr. Hanson, the Pratt & Whitney Company, which is a subsidiary of the Niles-Bement-Pond Corporation, has become one of the principal manufacturers of machinery in the United States. Its business has increased enormously during the war. Before that time and in the early months of the war, the force employed numbered between 1,200 and 1,500 men, while it has now increased to about 3,500.

At a recent annual meeting of the Manufacturers' Association of Hartford County, T. J. Kelley, the secretary, made a report in which he said that between 8,000 and 10,000 employees had been added to the working forces of factories in this county during the past year. Over 1,000,000 square feet of space has also been added, he said. He reported that he expects to see about 5,000 more men working in the factories in this county before another year.

Philip B. Gale, manager of the Hartford Machine Screw Company, was elected president of the Standard Screw Company at the annual meeting held in New York recently. He has been acting president of the company since the death of W. B. Pearson, of Chicago. R. H. Schutz, also of this city, was elected a member of the executive committee of the Standard company to fill a vacancy.—P. B. D. S.

PROVIDENCE, R. I.

JULY 9, 1917.

The month of June added another to the long list that has been making unprecedented history for the metal trades in this city and vincinity. With the exception of the manufacturing jewelry and its allied industries, the rush in all metal lines continues with no immediate indications of any cessation. Help is practically impossible to obtain; most of the concerns are behind on orders with additional bookings continually coming in and little prospect of vacation or renovation periods of any length.

The number of local concerns engaged in manufacturing munitions, supplies or other articles for the government or the Allies is surprisingly large, the list of concerns from the vicinity of which all enemy aliens must keep away recently published being a startling revelation to a majority of persons who were not fully informed as to facts.

The census of manufacturers for 1914 issued a few days ago by the Bureau of Census of the United States Department of Commerce contains considerable information of more than usual interest to the metal trade, showing trade conditions during the present "war period." The report shows that Rhode Island ranked nineteenth among the States in value of products of its manufacturing industries, and fourteenth in average number of wage earners employed.

However, the report brings out the fact that the growth which took place in the industries of Rhode Island during the decade of 1899-1909 did not continue during the five years of the period of 1909-1914. In fact, as measured by value of products, value added by manufacture, and number of wage earners employed, the State's industries showed an actual decline during the latter period. It is noteworthy, however, that the number of salaried employes, amount of primary horse power and amounts paid for salaries and for rent and taxes showed considerable increase.

The census bureau reports that there were 2,190 manufacturing establishments of all descriptions in Rhode Island in 1914, in which 124,109 persons were employed; the capital invested was $308,444,563; over $13,000,000 in salaries were paid to officials and clerks, etc., and $59,366,000 was paid to wage earners. The taxes paid aggregated $3,116,000; materials cost a total of $156,543,000; fuels and power rentals, $5,882,000. The total value of products was $279,545,000; the value of added manufacture was $117,120,000, and the primary horse power used in the industries was 269,000 horse power.

Henry L. Stanton, 100 Park street, Attleboro, is owner of the City Welding Company, 172 Pine street, this city, according to his statement filed at the office of the city clerk.

The Ideal Die Casting Company, 756 Eddy street, is being conducted by Peter J. Gunn, of 153 Burnside street, and William B. Blifford, of 167 Lenox avenue, according to their statement on file at the city clerk's office.

Roswell A. Calin, of 241 Ohio avenue, and Charles W. Osberg, of 336 Douglas avenue, are proprietors of the Calin Novelty Company, 77 Page street, according to their statement to the city clerk.

Harry H. Avakian and Arshaloos Kechijian have filed their statement at the city clerk's office that they are the owners of the Crown Enameling Company, 9 Calender street.—W. H. M.

BOSTON, MASS.

JULY 9, 1917.

The great news feature of the expiring month was the Industrial Trade Exposition and Export Conference at Springfield, Mass., which extended over a week beginning June 23, and drew together the leading manufacturers and metal men from all parts of New England. Thursday, June 28, was "Metals Day," when more than 500 representatives of the trade took part in the proceedings. At the morning session Adolph W. Gilbert, of the Chapman Valve Manufacturing Company, Indian Orchard, Mass., spoke on 'Metal Fittings in Over-seas Trade."

The real problem of over-seas trade, he said, depends on labor, sea transportation and finance. The high cost of labor he attributed to the spirit of individual freedom which has been fostered here by free immigration. C. O. Smith, export manager of the Norton Grinding Company, Worcester, Mass., spoke on "After the War—What of Machinery Export?" Oren O. Gallup, Simonds Manufacturing Company, Fitchburg, Mass., chose as his subject, 'American Tools in Foreign Markets." Charles E. Hildreth, general manager of the National Machine Tool Builders' Association, Worcester, was presiding officer. At noon the metal tradesmen dined from a whole sheep, baked for their special benefit. J. S. Holt, of Worcester, guarded the delectable feast until it was roasted to his satisfaction. He has been conducting sheep bakes and barbecues since the days of the Civil War. Next year it is planned to extend the conference and exposition to the whole of the Union.

The foundry building at Montvale, Woburn, formerly occupied as a brass foundry by the Smith & Wallace Company, and now operated by the Boston Armature Company, of which Philip J. Murphy, of Brookline, is manager, was burned June 29, causing a loss on building and contents estimated at $10,000, covered by insurance. The plant, in addition to the foundry work, has been used for making shell parts for the Allies, but it is said that the munition contracts were all filled, and that the ordinary foundry work was all that was being done.

More and more contracts for the government are being given out, some of them direct and some sub-let. It is believed that a very large part of the trade among the local manufacturers will be taken up by this kind of work. There is no improvement in the labor situation from the preceding month. The demand for skilled help is just as great as ever, and there is not much relief in sight. The idea seems to be prevalent that, if anything, conditions will grow worse rather than better within the next six months. A large number of manufacturers are studying the problem of utilization, following in the footsteps of the American Steel & Wire Company and other large concerns, who are calling in their pensioners over 60 years of age for work. Another method by which they are trying to overcome the labor stringency is by introducing premium and other systems by which they may increase the efficiency of the men now at work and thus secure greater production with the same number of employes.

The Boston branch of the Metal Trades Association held its regular monthly meeting at Young's Hotel June 6. Professor J. Paul Saxe, Harvard, spoke on the Liberty Loan, whereupon the organization voted $1,000 toward the issue. Commander Frank Lyon, Charlestown Navy Yard, told what was being done there, and Professor Hollis addressed the company on "The Engineer's Place in the World."

The latest foundry company to be formed is that of the Worcester Foundry Company with a capital of $50,000. The president is Frank Hayes, Waterbury, Conn.; treasurer, Michael E. Keeley, Waterbury; clerk, Thomas J. Finn, Worcester.

Another company granted a charter this month was the American Crucible Company, Boston, with a capital of $150,000. The concern will deal in materials used in the melting of metals. The president is Lyon Weyburn, Boston; treasurer, William McKee, Newton; clerk, Victoria H. Mayr, Jamaica Plain.—R. T. E.

ROCHESTER, N. Y.

JULY 9, 1917.

Metal conditions in this city are rather quiet just now. There are many reasons for this, even though local foundries are apparently well supplied with the filling of present orders. The market here as a whole is erratic, and there appears to have been little or no improvement in conditions during the past month.

Large users of all metals are in a hesitating mood, owing to the uncertainty of the final action of Congress. Big manufacturers are really confused by the enormous quantity of talk and little action taken by Congress at this time, particularly in view of the fact that the great metal industries of the country may soon be called upon to produce to their utmost.

The chief cause for worry in this section is the future tariff rates to be adopted by Congress. It is feared that metals, both scrap and finished product, will be taxed by the Government both in entering and being shipped from the country. The fact that Rochester is on the Canadian border and that of late years has exported immense quantities of finished metal products into that country, brings the situation before the metal men with all seriousness.

The Symington Machine Company, which is a war issue of the T. H. Symington Company, of Baltimore and Rochester, has obtained an order for 3,000,000 shells from the war department. The company is now in the market for 20,000 tons of steel, it is estimated here. The Hoffman shell plant in Lyell road, just over the city line, in Gates, is being put in condition to resume the making of shells within a short while. About 1,500 men were employed there a year or so ago.

In the scrap metal market business is remarkably quiet. Copper is bringing from 24 to 27½ cents a pound; red brass, 25 to 27 cents; yellow brass, 17 to 20 cents; lead, 11 to 12½ cents; and zinc, 7 to 9 cents. Spelter is in strong demand at most all times. It is quoted here at 9 cents, east of St. Louis. There is little doing in aluminum, and prices are quoted at 40 to 48 cents. Babbitt metal is held at 10 to 12 cents.—J. B. C.

CLEVELAND, OHIO

JULY 9, 1917.

The metal trades in Cleveland at present are as active as the present unusual conditions will allow. Metal of all kinds is scarce and such as can be secured arrives slowly on account of bad shipping conditions. Some metals, such an antimony, is out of the market altogether, the principal Cleveland jobber quoting a nominal price, based on New York.

Shipping conditions, which have been aggravated recently on account of congestion in Cleveland yards has improved in the past two weeks due to efforts at relief undertaken by D. F. Hurd, traffic commissioner of the Chamber of Commerce. Much trouble had been experienced in getting consignees to move their goods after their arrival due to the fact that many of them did not have sufficient storage space and they preferred to pay demurrage to renting commercial storage. A campaign was undertaken to keep the incoming shipments moving, the Erie railroad, going the length of printing lists of consignees on the daily papers. One list contained the names of 384 Cleveland firms. Local yards have also been cleared by the formation of the Lake Erie Bituminous Coal Exchange, whose object is to pool all coal arriving at lake ports between Erie, Pa., and Toledo, O., for water shipment, so that it may be loaded immediately upon arrival and the ships and cars kept moving. Cleveland metal manufacturers all report that they are feeling the good effects of this movement by better service at the freight houses and prompter spotting of cars.

Twenty-two members of the Cleveland Manufacturing Jewelers' Association, at a recent meeting, decided that that organization would not affiliate itself with the National Manufacturing Jewelers' Association. The reason given was that, although the jewelry manufacturing industry here is of considerable importance, taken as a whole, the lack of any large factories, like those in the East, left the Cleveland manufacturers little in common with the members of the national association. The matter was left at that stage for the present.

A. E. Schultz, who has been in business for the past year at 506 Swetland building, is adding additional space and working facilities to his shop. His principal work is in gold and platinum.

James H. Herron, of James H. Herron Company, metallurgical and testing engineers, has been elected president of the Cleveland Engineering Society for the coming year. He was installed at the 37th annual banquet of the society at the Hollenden Hotel, June 12. Two hundred and fifty members were present. Honorary membership was conferred upon Ambrose Swasey, of Warner & Swasey Company, manufacturers of scientific instruments, and Samuel T. Wellman, of Wellman-Seaver-Morgan Company, manufacturers of metal products; both past presidents of the society.

Metal product interests in Cleveland were heavy contributors both to the Liberty bond issue and the Red Cross. Following are some of the metal firms taking Liberty bonds: Buckeye Brass & Manufacturing Company, Cleveland Electro Metals Company, Fulton Foundry Company, Brierly Machine Company, Art Engraving & Electrotype Company, Warner & Swasey Company, American Range & Foundry Company, A. J. Hall

Cycle Manufacturing Company, Frantz Premier Company, Cleveland Copper Ferule Company, Bryant Heater & Manufacturing Company, Cleveland Dental Manufacturing Company, S. K. Elliott Electric Company, Cleveland Co-operative Stove Company, I. Cohen & Sons Company, Cleveland Heater Company, Cleveland Folding Machine Company, American Brass Manufacturing Company, Standard Parts Company, Champion Machine & Forging Company, Chandler Motor Car Company, Chandler & Price Company, Federal Screw Company, Ferro Machine & Foundry Company, Ferry Cap & Set Screw Company, Bialosky Brothers & Company, Miller Chemical Engine Company, Fitch Electric Company, American Watchman's Time Indicator Company, Domestic Electrical Company, Forest City Bedstead Company, American Multigraph Company, Chandler Motor Car Company, F. M. Grant Electric Company, Rosenthal Jewelry Manufacturing Company, Imperial Steel Range Company, Standard Sewing Machine Company, Case Hardening Company, Enterprise Aluminum Company.

Following are a few of the Red Cross subscriptions which aided in oversubscribing Cleveland's quota 100 per cent: National Acme Manufacturing Company, $35,000; Cleveland Metal Products Company, $15,000; Park Drop Forge Company, $15,000; American Multigraph Company, $10 000; K-W Ignition Company, $3,000; Bouren Steel Range Company, $500; Hertner Electric & Manufacturing Company, $250; Globe Machine & Stamping Company, $1,000.—C. C. C.

CINCINNATI, OHIO

JULY 9, 1917.

The obvious and increasing demands of Government work on the various branches of the metal industry are having their effect on business in this vicinity, making it, if possible, more active than has been the case so far this year. As a matter of fact, operations in the great machine-tool shops have never ceased to run at maximum capacity, calling for a corresponding consumption of brass and other materials; but with an immediate need for a marked stimulation in the output of factories devoted to the manufacture of arms and munitions, the machine-tool makers have been urged to speed up the production of the machines required for that purpose. The result is that the enormous activity of the past year will in all likelihood be surpassed during the coming year, the only possible obstacle being the scarcity of the skilled labor required. Many of the plants have had excellent results with unskilled men, however, selecting intelligent workers and training them for various duties, and it is hoped by this method to keep the factories running twenty-four hours a day. There has been some talk of following the example of England, and employing women for the lighter operations, but so far this has not yet been attempted locally.

The coppersmiths catering to the various branches of the liquor trade have had comparatively little to do in that line of late on account of the serious prospect of national legislation which will virtually put the distilleries and breweries out of business. Confronted by such legislation, these interests are, of course, making no expenditures on improvements, and are building no new plants. It is possible that there will be many distilleries converted to the manufacture of commercial spirits, especially for the use of manufacturers of explosives, and this would serve to give the copper men some welcome business.

One of the most liberal contributors in the Cincinnati campaign for the collection of a million-dollar fund for the Red Cross was the Lunkenheimer Company, which gave large amounts at several different times. The generosity of the business interests of Cincinnati resulted in the city's quota of $1,000,000 being exceeded by more than fifty per cent, the total subscribed being $1,650,000.—K. C. C.

COLUMBUS, OHIO

JULY 9, 1917.

Firmness characterizes the metal market in Columbus and central Ohio territory. Demand for all metals have ruled good, and with supply fairly good there has been an excellent volume of business. Prices are still ranging firm, and what changes have occurred since the last month have been towards higher levels. Liberal buying on the part of a large majority of metal-using concerns is reported. Practically all of the buying, however, is for present needs, as most of the concerns are loath to accumulate a supply for the future.

The car shortage is now considerably improved and as a result shipments are coming out more promptly. Munition factories are still busy and the same is true of other lines of manufacturing. The labor shortage is having its effect but the situation is expected to improve soon.

Brass is firm and the demand continues brisk. Red brass is selling at 26 cents while yellow brass is quoted at 20 to 21 cents. Copper is one of the strongest points in the market and prices are unchanged from the previous month. Aluminum is also in good demand and is selling at 55 cents for scrap. Zinc is still weak but more strength is expected soon. Tin is strong and the same is true of babbitt. Type metals are one of the strongest features.

The Ohio Metal Company, of which Henry Loeb is president, located at Fourth St., and Fourth Ave., Columbus, O., is having an excellent business in every way. The best feature of business at the present time is the demand for babbitt and type metals. The type metal output of the Ohio Metal Company is approximately 1,000 tons yearly.

The Dayton Metal Products Company of Dayton, Ohio, has awarded contracts for the erection of a seven-story concrete building 60 x 180 feet, to be devoted to general manufacturing purposes. Col. H. E. Talbert, head of the company, says that the company is preparing to expend a large sum of money on factory construction and equipment. Other extensions are contemplated which will be devoted to the manufacture of ammunition.

The D. Labold Company, of Portsmouth, Ohio, has been incorporated with a capital of $25,000 to deal in metals. The incorporators are Daniel Labold, Goodman Rosengarten, Celia R. Labold, Simon Labold and Robert Stern.

The Dayton Stamping and Tool Company, of Dayton, Ohio, has been incorporated with a capital of $250,000 to do a stamping business. The incorporators are James G. Mitchell, Frank Moeschl, I. I. Hauer, V. A. Troxell and Harry M. Wolfe.

The Western Metals Company, of Cleveland, Ohio, has increased its capital from $10,000 to $50,000. J. W. L.

CHICAGO, ILL.

JULY 9, 1917.

It is usual with the advent of the warm season to find decline in demands among some of the manufacturers in the metal lines, and with the higher costs of materials and metals now in effect and metals now in effect and the conservatism in commitments little surprise would be occasioned if there was a falling away or let up in business. Yet on the contrary current operations indicate that altogether with notably enlarged production there is much new inquiry and more urgency as to supplies for ordinary and governmental consumption.

Needs steadily broaden in their nature and aside from the pressure manufacturers of brass goods here are getting a gratifying share of general business, and some of them are adding additional additions to meet the extraordinary growth of requirements.

A shrinkage in local construction this past month affects slightly the manufacturers of plumbing and steam brass goods, and enables them to catch up on back orders.

The Goetz Brass Company, located on Franklin street, are running their plant to full capacity on a large government order for shower heads and equipment to be used at the different cantonments throughout the country for the housing of troops, and which are now in course of construction. The Mid-West Brass Manufacturing Company, located at North Aurora, has some orders on hand for brass clean out ferrule covers to be furnished to the large cast iron pipe foundries in the South and also for the Central Foundry Company of New York, which will keep them busy for some time.—P. W. B.

ST. LOUIS, MO.

JULY 9, 1917.

Large army contracts are keeping the stove plants, the most extensive feature of the plating industry of St. Louis, excep-

tionally busy, and some big orders are being turned out, with the prospects good for more business. The manufacture of stoves and equipment for Uncle Sam's forces promises to be a big factor here. St. Louis is going after this class of business with vim. A representative of the Chamber of Commerce was sent to Washington to get as much of this business as possible, impressing upon the authorities the superior facilities of St. Louis in this line of manufacture. Among the concerns that now are turning out stoves and equipment for the government are the Wrought Iron Range Company, Majestic Manufacturing Company and Quick Meal Stove Company.

The job plating works report that business is good, much better than usual. With the increased cost of production, due to the higher prices for all raw materials and recent advances to labor, there is complaint that the margin of profit is too low. Work is being turned out at too low a price, and it is contended that there must be an advance. Charges are made that some concerns are trying to force business by cutting prices, regardless of the high cost of production.

The Musick Plating Works, of which W. H. Musick and E. J. Musick are proprietors, are now in their new location at 915 Chestnut street, after having been in one block on Market street for 35 years. The new plant occupies 4,100 square feet, all on the ground floor. The shop is a model from every standpoint, light, airy and sanitary, and arranged with an idea to getting the most efficient results. The Missouri State factory inspector especially praised the shop for the arrangements for the comfort of the workers. Every part of the shop is well lighted, there being 68 large windows. Twenty men are employed by the works.

The newest plating works in St. Louis is the Columbia Plating Company, of which F. O. Lutz is manager. Stove work constitutes the biggest part of its activities, although considerable other job work is being done. Fifteen men are employed here.

Within the last ten days prices and demand for lead have eased off considerably. This condition has been caused by the uncertainty relative to what the government is going to do and how the Washington program will affect the situation in general. There still is virtually nothing for spot delivery, and very little for July shipment, but the more remote futures are easier. Nominally quotations at the end of the week were $11.25 bid and $11.50 asked per 100 pounds. The high three weeks ago was $12.25. The zinc market continues to be quiet. For July delivery the quotation is nominally $9.25 asked, but no bids or offerings for sports were heard.

E. Rouse Thompson, vice-president of the St. Louis Tin & Sheet Metal Working Company, reports that the company now has enough business on its books to keep the plant busy for the next five or six months, and is not taking on any new business.

Charles R. Meston, who for many years was manager of manufacturing for the Emerson Electric Company, has closed the laboratories in which he sought to perfect an invention for cheapening electrical refrigeration, and has entered a sanitarium in Cromwell, Conn., to recover from a nervous breakdown.

The Photo Engravers of the United States, who met in St. Louis last month, adopted resolutions agreeing to conserve the supplies of copper, zinc and chemicals used by them in their work during the period of the war. These officers were elected: President, E. C. Miller, Chicago; vice-presidents, Adolph Schuetz, of New York, and C. A. Stinson, of Philadelphia; secretary and treasurer, J. C. Bragdon, Pittsburgh; executive committee, F. W. Gage, Battle Creek, Mich.; E. W. Houser, Chicago; G. W. Danz, St. Louis, and David Parkinson, Detroit.

The two-story and basement building at the northwest corner of Eleventh and Ferry streets, has been leased to the Valley Tool Company, a new corporation organized for the manufacture of all kinds of tools.

J. Harrison Steedman, vice-president of the Curtis & Company Manufacturing Company, although 50 years old, is a member of the naval Reserves, and is now in training at the Great Lakes Station.

Word from Frank C. Rushton, secretary of St. Louis branch of American Electro-Platers' Society, and foreman of the plating department of the Charter Oak Stove & Range Company, who is training with the Officers' Reserve Corps at Fort Riley, is that he is working hard, but that he is enjoying himself.—R. M. E.

LOUISVILLE, KY.

JULY 9, 1917.

General manufacturing lines continue taking a fair percentage of brass and copper castings, babbitt and other metals, but as the bulk of the copper business in Louisville is among the Kentucky distillers, the outlook at present is duller than it has been for years. The food conservatists and prohibitionists between them have about killed any prospects for a continuation of distilling of any sort of beverage liquors in Kentucky and vicinity for the duration of the war, and it is felt that the prohibition movement has reached a stage where unrestricted liquor manufacturing may never bloom again.

Manufacturers of explosives have been consuming large quantities of alcohol for some time past, and it is expected that the Government will shortly be in the market for large supplies. During the past two years a number of old beverage whisky plants have been making alcohol, and there is a good prospect for many of the Kentucky plants being converted into alcohol distilleries. Due to the high cost of coal and grain the few plants which have been making alcohol have discontinued operations for the present, but with a fair corn crop this season it is estimated that the coppersmiths may obtain numerous orders for remodeling plants so that they will be in position to manufacture commercial grain alcohol. Outside of this one chance the distillery business is in bad shape. Several of the local copper working houses are at present doing nothing, and have nothing in sight.

Manufacturers and jobbers of plumbing goods of various kinds are looking forward to some big orders in connection with the new cantonment or Government military training camp at Louisville, which is to house 45,000 soldiers from Kentucky and Indiana. Work on this plant has started, it to cost $6,000,000, and be completed about October 1. In the meantime the local utility concerns are spending $500,000 in improvements or in carrying extensions to the camp site, such as telephone, street car and water lines. The Government will spend $1,500,000 on salaries and supplies each month after the camp is in operation, and this should result in generally increased prosperity for Louisville. The plumbing and heating contracts are yet to be let.

The Hart Manufacturing Company, of Grand Rapids, Mich., recently incorporated in Kentucky with a capital of $60,000, has secured a site for its plant at Fifteenth and Madison streets. The company manufactures brass and other goods, including heating and ventilating systems, bubble fountains, and also field-baking outfits for the Government. A. E. Hart is president; H. K. Cole, secretary-treasurer; and C. E. Olsen, sales-manager. The company will shortly begin manufacturing in Louisville.

While local handlers of sheet copper and other copper and brass materials had been expecting a drop in the market during the month, the drop failed to materialize, and an advance is now in prospect. Sheet copper from a base price is quoted at 40 cents per pound; engravers sheets, 16 gauge, 56 cents; 18 gauge, 59 cents; bar copper, 43 cents. Freight is allowed on shipments of 300 pounds or more, while the price is two cents higher on deliveries made from local stock of sheet or bar. The copper market is not as good as had been expected, the edge having been knocked from the demand.

"Things have been going good with us for the past two months, and we have about all of the business we can handle in our present quarters," said J. W. Rademaker, of the Independent Brass Works, who stated that he had been very busy in making various kinds of castings, principally for elevator, milk machinery and electrical work, and also for the Government. Much of this work is in silver bronze.—O. V. N. S.

TRENTON, N. J.

JULY 9, 1917.

The erection of several large manufacturing plants in this city will give work to hundreds of skilled mechanics, including many metal workers. The John A. Roebling's Sons. Company is erecting a plant 700 feet long and 90 feet in width and four stories high, to cost about $300,000. The power house for this plant was recently completed at a cost of $10,000. The Westinghouse Lamp Company is completing a new plant on Pennington avenue to cost about $300,000. The main building is 500 feet long and 80 feet wide, consisting of four stories and a basement. The top floor is adapted to lamp manufacturing and is con-

structed in such a manner that there are no obstructions of any sort to bother the workmen. There is also a power house and garage. The company will turn out 50,000 finished lamps per day. The two top floors will be used exclusively for lamp manufacturing and the remainder of the main building for the storage of raw materials and finished lamps, cafeteria, dressing rooms, hospital, recreation room and offices.

Business continues good at the Trenton plants engaged in the metal industry. The E. E. Wyckoff Hardware Company recently erected a plant on Genesee street, and is manufacturing light hardware of various kinds. The Skillman Hardware Manufacturing Company is very busy and other Trenton plants sharing in the prosperity at the present time are the Trenton Smelting & Refining Company, Billingham Brass & Machine Company, Jordan L. Mott Company, Trenton Brass & Machine Company, McFarland Foundry & Machine Company, National Electric Plating Company, Bechtel Engraving Company, John A. Roebling's Sons Company, Mercer Automobile Company, Clifford Novelty Works, Movshovitz Smelting Company.

Labor conditions are pretty well settled at this time, and skilled metal workers appear to be satisfied with their wages. A number of men in the moulding department at the J. L. Mott plant went on strike for more pay. The strike was short lived. When the men found that the company would grant the desired increase they returned to work again.

Neither the Bordentown nor the Paulsboro plants of the Standard Fuse Corporation are in operation as yet following the completion of war orders for the European nations. Both plants are well equipped for the manufacture of any kind of ammunition and can be put into operation at short notice should the United States government find it necessary to take them over for war purposes.—C. A. L.

NEWARK, N. J.

JULY 9, 1917.

Business conditions are a little uncertain at the present time and this uncertainty is reflected in the local metal industry. With the average jewelry manufacturer and maker of silver goods business is quiet, for jewelry is a luxury. With the high price of foodstuffs and the uncertainty as to just how the war will affect the country, people are careful about buying things that are not needed. Manufacturers of high grade jewelry fare better than those who make medium quality and cheap goods. Certain classes of people have made money because of the war and they spend considerable sums for good jewelry, though not enough to make up for the small purchases of the many. In addition to the hesitancy in regard to buying all kinds of metal goods which might be classed as a luxury, the calls of the Liberty Loan and Red Cross campaigns have taken much spare money, some of which would have been spent for these things. There seems to be considerable optimism as to the fall. It is thought by many that when the policy of the government regarding the war is definitely known and business becomes adjusted to war conditions, that business will be good. Makers of metal goods which could be classed under the head of war supplies are generally very busy, though many contracts for munitions have been filled and there is not the rush in this line that there was several months ago. In the aggregate several hundred employes have been released by the many firms making war munitions. Prices of materials are high still, and the cost of many articles keeps going up. Some materials are almost impossible to get at any price.

Electroplating concerns continue to be quite busy, though business is unstable. Mr. Bugbies, of the Newark Nickel Plating Company, reports his June business was about normal. He says he could have done more business if he had been able to get a sufficient amount of capable help.

A large number of Newark metal manufacturers closed their factories for periods of from a few days to a couple of weeks about the first of July, for the semi-annual overhauling of machinery, engines, etc. Some of the rest will close the early part of August, and thus take advantage of vacation time.—R. B. M.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

Charles H. Gaylord is now connected with the Kelley Island Lime & Transport Company, Cleveland, Ohio, as manager of their Vienna lime department.

The Bay View Foundry Company, Sandusky, Ohio, has about completed the erection of a one-story, 60 x 120 feet, addition to its plant which will be used as a cleaning department.

The Michigan Copper and Brass Works, Detroit, Michigan, are building a one-story addition to its plant on Cavalry avenue. A casting shop and rolling mill are operated by this concern.

The Two Rivers Plating Works, Two Rivers, Wis., has completed the erection of a shop addition and is installing additional equipment for plating and re-tinning aluminum and other castings. The capacity has been about doubled.

The Roessler & Hasslacher Chemical Company, 100 William street, New York, report that the cyanide situation is easing up somewhat on account of the distributors being able to take better care of the market. Hope is expressed for better conditions in the near future.

The Apollo Metal Works, La Salle, Ill., has appointed G. A. Miller, 29 Broadway, New York, as their Eastern and foreign sales representative for their Apollo plated sheet metals which consist of nickel zinc, copper zinc, brass zinc, polished zinc, nickel tin, copper tin, brass tin and oxidized tin.

The American Tube & Stamping Company, Bridgeport, Conn., has awarded a contract for a one-story addition, 110 x 110 feet, with wing 20 x 66 feet. The company operates a tool and grinding romo, cutting-up shop, stamping, galvanizing, plating, polishing, japanning and lacquering departments.

The Premier Metal Etching Company, 625 East Eighteenth street, New York, is building a new two-story reinforced concrete plant, about 75 x 200 feet, on Van Alst avenue, Long Island City, N. Y., which will cost about $70,000. Arrangements have been made for all items required in the new plant.

The Manhattan Brass Company, 33 East 26th street, New York, has awarded the contract for a seven story factory. This company operates a brass machine shop, tool and grinding room, casting shop, cutting-up shop, rolling mill, spinning, stamping, brazing, soldering, plating, polishing and lacquering departments.

The Twentieth Century Brass Works, Minneapolis, Minn., is erecting at 518 Fifth avenue, a brick building 65 x 66 feet, two stories and basement. Considerable new equipment will be installed. The company operates a brass, bronze and aluminum foundry, machine shop for brass finishing and special manufacturing.

The Doehler Die-Casting Company, Brooklyn, N. Y., has entered suit in the United States District Court of New York against the Acme Die-Casting Company, Brooklyn, N. Y., charging the latter with infringement of the Doehler Die-Casting Company's United States patent 1,156,073, for white metal castings and method of making same.

The Wisconsin Aluminum Foundry Company, Manitowoc, Wis., is installing six new furnaces and is making other improvements, including the erection of a new storage house, 40 x 190 feet, to be better able to handle its orders. One of its largest contracts calls for 2,000,000 German silver bushings for the United States Army, and requiring a production of 10,000 castings a day.

The Superior Brass Manufacturing Company, Mansfield, Ohio, recently organized with a capital stock of $35,000, has started operations in its plant where they will devote all their time to the manufacture of brass goods on order or contract. The company also makes high grade crucible brass castings and operates

a brass, bronze and aluminum foundry, brass machine shop, tool and grinding room, plating and polishing departments.

The Wise-McClung Manufacturing Company, New Philadelphia, Pa., has taken over the plant of the Rath Aluminum Company and is building an addition for the manufacture of electric sweepers and electric washing machines. The company will operate a brass, bronze and aluminum foundry, principally for the manufacture of parts for their machines, but will do some job work, tool and grinding rooms, plating and polishing departments.

FIRE

The Peerless Foundry Company, Hamilton, Ohio, suffered a fire loss in its japanning department on June 21. No delay was experienced in finishing work on hand, as the department is already in operation.

NEW JERSEY ZINC CO. TO MAKE SHEET ZINC

The New Jersey Zinc Company is erecting a new sheet zinc mill at Palmerton, Pa., which will probably be in operation some time in July. The company's regular Horsehead brand of spelter will be used in the manufacture of the sheet zinc and nearly all gages and commercial sizes up to 24 in. will be rolled.

METAL COMPANIES' DIVIDENDS

The Scovill Manufacturing Company and the E. W. Bliss Company, which are doing a large munition business, continued their habit of declaring extra dividends. The former ordered an extra of 10 per cent. in addition to the usual 2 per cent. quarterly payment, due July 2. This makes 76 per cent. in cash declared so far this year on the moderate capital, and in addition a 25 per cent. dividend in Anglo-French bonds was paid. The latter concern voted an extra of 11¼ per cent. and the regular 1¼ per cent., payable July 2.

BUSINESS TROUBLES

The American Bronze Company, manufacturers of brass, bronze and aluminum castings, etc., Buffalo, N. Y., under date of June 21, announce that on account of its inability to continue business under present conditions it has seen fit to dispose of its property and divide the assets among the creditors. After considerable time it has been able to do this with a fair degree of success. The company also states that after collecting the bills and accounts receivable, there will be sufficient to pay something in excess of 50 per cent of the indebtedness of the company.

GOVERNMENT SPECIFICATIONS

Specifications for metals and alloys used by the United States Government, issued by the Navy Department during 1917 are as follows: Brass castings for electrical appliances, 46B12b; ingot copper, 46C5a; cast manganese bronze or composition, 49B3a; torpedo bronze, 46B13c; silicon copper or composition, 46B2b; German silver or composition, 46S3a; cast phosphor bronze composition, 46B5c; extra strong seamless brass pipe, 44P8a; manganese bronze ingots composition, 46B16a; Benedict nickel, rolled or composition, 46N1a; solder, 47S7a; rolled manganese bronze or composition, 46B15a; rolled Monel metal composition, 46M7a; silicon copper, 46C2b; rolled zinc plates or composition, 47C4a, and phosphor copper or composition, 46C3b.

CHANGE IN FIRM NAME

A. V. Monroe has taken over the business of the Monroe & Smith Manufacturing Company, Taunton, Mass., and is operating under the name of the Taunton Welding Company.

The Burns & Bassick Company, Bridgeport, Conn., the M. B. Schenck Company, Meriden, Conn., and the Universal Caster & Foundry Company, Newark, N. J., have been merged as the Bassick Company, Bridgeport, Conn., with a capital stock of $6,000,000. The officers are Edgar W. Bassick, president; W. A. Schenck and W. R. Bassick, vice-presidents; F. C. Bassick, secretary; W. F. Burns, treasurer; C. H. Knapp, assistant treasurer, and A. E. Belisle, assistant secretary. The company operates a brass and bronze foundry, brass machine shop, tool and grinding rooms, stamping, brazing, plating, polishing, japanning and lacquering departments.

BUFFALO COPPER MILL SOLD

Announcement is made by William A. Morgan, president and general manager of the Buffalo Copper & Brass Rolling Mill, Buffalo, of the sale of the company to the American Brass Company, of which Charles F. Brooker, of Ansonia, Conn., is president. The business and plant of the Buffalo company passed formally to the purchasing company after the ratification of the sale by the stockholders of the former company at a meeting held July 6. The consideration, which is presumed to amount to several millions, has not been made public.

The Buffalo plant is an extensive one and employs over 5,000 men, and increased operations will start in the mill shortly after the change in ownership. Aside from the withdrawal of Mr. Morgan from the company the organization of the old company will be continued by the new owners.

The American Brass Company has three mills at Waterbury, Conn.; two at Ansonia and one each in Torrington, Conn., and Kenosha, Wis.

INCREASE IN CAPITAL STOCK

The Western Metals Company, Cleveland, Ohio, has increased its capital stock from $10,000 to $50,000. The company buys and sells all kinds of non-ferrous metals.

The American Metal Company, New York, has increased its authorized capital stock from $3,500,000 to $25,000,000. The outstanding stock will only be raised to $7,000,000. The company handles over 100,000,000 pounds of copper per year, as well as large quantities of lead, zinc and other metals.

The Perkins Foundry Company, Inc., 46 Bridge street, Amsterdam, N. Y., has increased its capital stock from $20,000 to $50,000. The company announces that they are not having plans prepared for the erection of an addition to its plant as reported. A brass and bronze foundry, tool and grinding room and polishing department are operated by this company.

REMOVALS

The Watson-Stillman Company is erecting a shop, 60 x 130 feet, 40 feet high, at its plant at Aldene, N. J. The company operates a brass and bronze foundry and tool room.

The General Electric Company, Schenectady, N. Y., announces the removal of the New York offices from the Hudson Terminal Building, 30 Church street, to the Equitable Building, 120 Broadway.

The W. A. Fuller Company, manufacturers of Natrolin metal cleaner, has discontinued its Pittsburgh, Pa., office and has removed same to Greensburg, Pa., where its factory is located. The company is now incorporated under the laws of Pennsylvania.

The Parsons Manufacturing Company, Detroit, Mich., manufacturer of automobile hardware, has moved into its new plant at Stanley and Vermont avenues, where its capacity will be greatly increased. The company operates a tool room and stamping department.

The offices, sales and manufacturing departments of the J. M. Ney Company, manufacturers of silver solder, gold refiners, etc.,

Hartford, Conn., have been moved from the old location at 265 Asylum street to the fine, spacious new building at the corner of Elm and West streets. The Ney Company is one of the oldest gold refining establishments, having been in continuous business here for more than 105 years.

ALUMINUM COMPANY OF AMERICA

The Aluminum Company of America, Pittsburgh, Pa., announces that it did a gross business of $25,940,427 in 1916 from the sale of 86,589,774 pounds of aluminum at an average price of 29.96 cents a pound. In addition the company supplied to its subsidiary, the United States Aluminum Company, 24,821,061 pounds of aluminum which was fabricated by the latter concern.

The Aluminum Company has capacity for producing 155,000,000 pounds of aluminum annually in the United States and 20,000,000 pounds a year in Canada, a total of 175,000,000 pounds. With no importations since the outbreak of the war this company has been called upon to furnish the entire requirements of America, whereas formerly 40 per cent. of the requirements here was imported from France and England.

In the refining of aluminum this company has absolutely no competition in the United States. Bauxite, the base of aluminum, comes chiefly from Arkansas. It takes about six tons of bauxite to make one ton of aluminum.

For 1918 delivery the Aluminum Company of America has named 37 cents a pound as its price, although it has sold as high as 60 cents a pound. The April average was 35 cents. As to costs the company maintains strict secrecy, although officials admit it costs $3.50 to put a ton of bauxite on the cars at the mines in Arkansas.

Although capitalized for only $20,000,000 the Aluminum Company has a plant investment of more than $80,000,000, the difference representing present surplus. Approximately $70,000,000 of undivided profits has gone back into the property since the company was organized.

C. B. Fox, general manager of the Aluminum Company of America, East St. Louis, Ill., announced that his company had received a government order for 4,000,000 aluminum tent stakes, and so far as is known this is the first instance of aluminum being substituted for wood for this purpose. The company has offered to supply the stakes at about 30 cents per pound, and as each stake weighs about two pounds each, the total price is about $2,400,000. The company is also making a million canteens for the government and has been making canteens, ingots and other supplies for the Russian government for several months. These finished products are turned out at the Pittsburgh, Pa., plant.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the name of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To operate a foundry.—Chicago Brass Works, Chicago. Ill. Capital, $10,000. Incorporators: P. S. Kelly, James E. Kelly and M. C. Kelly.

To do general foundry work.—The Gallison Brass Foundry Company, Lawrence, Mass., Capital, $5,000. Directors: P. C. Wiggin, president; Frances B. Mowry, treasurer, and J. M. Gallison.

To manufacture metal alloys and metallic compounds.—The Sweetser & Bainbridge Metal Alloy Company, Albany, N. Y. Capital, $10,000. S. P. Sweetser, E. F. Bainbridge and H. G. Batcheller.

To manufacture metal molds, etc.—Stamping Products Corporation, New York. Capital, $25,000. Incorporators: S. B. Sherman, C. A. Anderson and G. C. Steeves, 630 West 141st street, New York

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

PRINTED MATTER

Minerals.—The Foote Mineral Company, Philadelphia, Pa., has issued its Mineral Foote Notes, No. 7, for July. This particular issue covers the metals Caesium, Rubidium and Thallium and ores containing these and kindred rare metals.

Aluminum.—The United Smelting & Aluminum Company, New Haven, Conn., has issued a very interesting and valuable aluminum stock list which gives the gauge, size, temper and quantity of the aluminum metal that they have on hand compiled up to June 15, 1917. This stock list also gives a table of the weight per square foot of aluminum of various gauges. Copies may be had upon request.

Photomicrographic Apparatus—A very interesting pamphlet has been issued by Sauveur & Boylston, metallurgical engineers, Cambridge, Mass., giving illustrations and descriptions of the photomicrographic apparatus designed and sold by them. Any concerns contemplating the establishing of a department for the micrographic examination of its products will find all the information that is needed to select such an outfit in this new circular MIV.

Platers' Wrinkles and a list of the chemical, commercial and common names of chemicals used in the dipping, plating and coloring of metals have been revised and published in the form of a little 32-page booklet, and are now ready for distribution by the publisher, THE METAL INDUSTRY PUBLISHING COMPANY. These wrinkles consist of valuable hints and suggestions that have been compiled from the extensive practical experience of Charles H. Proctor, the well known authority on electro-plating subjects. The information given in this booklet has been thoroughly revised and brought up-to-date with current practice.

Metal Cleaner—The Oakley Chemical Company, New York, N. Y., has issued a little booklet on the subject of the cleaning of metals. The particular cleaners described in the booklet are O. P. C. (Oakite Platers' Cleaner) and Oakite. A great deal of very valuable information is given as to modern methods for cleaning metals before and after plating processes. There are also shown several interesting micrographs which tell of the action of the Oakite compounds, as, for instance, the emulsification of oils. There are also some very valuable formulas, including those for cleaning jewelry, removing tripoli and sand buffing mixtures from metals of all kinds.

Grinding and Polishing Machinery—The Gardner Machine Company, Beloit, Wis., has issued a new catalog descriptive of their extensive line of grinding and polishing machinery and supplies. The catalog consists of 122 pages, bound in boards and is standard size, 7x10 inches. The book contains complete information about and is profusely illustrated with half-tone cuts of the following machinery and supplies: Disc grinders for metals, disc grinders for pattern shop, disc grinder accessories, ring wheel grinders, band finishing machines, polishing and buffing lathes, ring wheel chucks, fixtures for disc grinders, abrasive discs, cloth and paper; disc wheel cement, soft metal wax and disc grinder grease.

Electroplating Supplies.—The Canadian Hanson & Van Winkle Company, Ltd., Toronto, Can., has issued a most comprehensive catalog together with a supplement of electroplaters' supplies and equipment. The catalog proper is No. 9 and contains two hundred and sixty pages and is the first purely electroplating catalog that has ever been compiled for exclusive distribution in the Dominion of Canada, and is an excellent illustration of the progress that is being made in that country in the

electroplating field. In addition to illustrations and descriptions of everything used in the plating and finishing of metals, the catalog contains a large number of most valuable formulæ for plating and cleaning solutions. The supplementary catalog B, consisting of 104 pages, is devoted to descriptions and illustrations of polishers' and buffers' supplies, grinding machinery, dynamos, lacquers, and chemicals. Copies of these catalogs will be sent upon request.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE

JULY 9, 1917.

COPPER.

The copper industry during June was plagued not only by labor difficulties, serious strikes at mines and smelters, but by inadequate transportation facilities, all of which conditions operated in giving rise to continued reports of decreasing production. Buying for domestic consumption was held practically in abeyance because of the uncertainty existing as to United States Government prices, which were still under discussion toward the close of the month. Prompt and early positions at the close were held at 30.50-31.50 cents for prime Lake; 32.25-32.50 cents for electrolytic; 30.00-30.50 cents for casting copper, while July electrolytic was 31.25-31.75 cents and third quarter was 30.31 cents, with fourth quarter held at 28.75-29 cents per pound on July 5.

TIN.

The month of June was a very unsatisfactory one to the tin trade. Uncertainty as to the United States adjustment of vital points under discussion, combined with delayed foreign cables, had a disquieting effect that interfered with regular business transactions. A sharp reaction of 3¾ cents per pound to 60.50 cents occurred early in the month, this being the lowest price, after which there was a more or less gradual recovery to 64 cents on the 19th and 20th, followed by another recession to 62.25 cents in the closing days. Arrivals for the month on June 28 were 1,520 tons with 3,018 tons reported afloat.

LEAD.

The American Smelting & Refining Co., in June made two advances—a total of 1 cent per pound—in its official base price of lead, to 11 cents New York, and 10.92½ cents St. Louis, causing a fractional rise in the outside market price—which previously had remained unchanged from the May closing. Prices at close of month: 11.25-11.50 cents for spot, 11.25-11.50 cents for July and 11.25-11.37½ cents for August New York, with St. Louis 11-11.50 cents for spot, and 11-11.50 cents for July and August, a net decline of ⅛ cent per pound by June 30.

SPELTER.

All positions of prime western spelter on June 1 were held at practically the same figures: 9.55-9.67½ cents New York and 9.37½-9.50 cents East St. Louis, the exception being that July and third quarter positions ranged higher—from 9.55 to 9.80 cents New York and from 9.37½ to 9.67½ cents East St. Louis. Throughout the month business was inactive except in brass special which was in fair demand at 9.87-10 cents for prompt shipment and at 10-10.50 cents for futures at East St. Louis.

ALUMINUM.

The aluminum market for June was very dull but prices remained firm with no change in quotations for No. 1 virgin 98-99 per cent pure, from 59-61 cents, it was understood that some small sales for prompt and June shipments were made at 60-60.50 cents New York. Pure 98-99 per cent remelted held steady throughout the month at 56-58 cents, while No. 12 alloy remelted was very firm at an advance of 1 cent to 42-44 cents after June 7, until the close. The feature of the month was the offer of the Aluminum Company of America to supply all United States Government needs at 27.50 cents per pound—the average price, plus 2 cents for the past ten years. Two large contracts for the army were placed on this basis.

ANTIMONY.

The antimony market at the beginning of June was unsettled, and the downward trend in prices continued throughout the month on prompt positions, from 22.00-23.00 cents, duty paid, June 1, to 17.75-18.25 cents on June 30, a decline of 3.75-4.25 cents. In the latter half of the month there was a gradual falling off in the volume of business transacted in futures, with a net decline from the May closing prices, of 1.50 cents on June; .75 cents on July and .50 cents on the August positions.

SILVER.

A continuous demand for silver from the Federal Government during the first three weeks in June, combined with renewed buying in the Far East, carried prices of silver to a new high level on June 22, 78½ cents, this being an advance of 3⅝ cents per ounce from June 1. After a recession of ½ cent to 78 cents on June 25, an advance of ¼ cent occurred on June 27. Shipments of silver to the Far East are now made from United States Pacific ports in preference to the former method by way of Atlantic ports through London markets.

QUICKSILVER.

Heavy arrivals of quicksilver combined with a lack of buying interest in June carried prices downward from $96 per flask on June 1, to $80 on June 27—a net decline of $16 per flask. An advance to $85 occurred June 30.

PLATINUM.

Early in June, a new discovery of platinum in the mountains of Spain, now being investigated by the Spanish Government, interested the trade, which awaits an accurate estimate of the potential value of the platinum deposit. Prices were unchanged during the month from the previous high level which has prevailed for the past several months. $105 for pure and $110 for 10 per cent iridium.

OLD METALS.

Early in June there was a lull in the activity that has characterized the general old metals trade for several months past, but the scarcity of scrap metals being acute and competition keen, prices remained firm and unchanged at the previous high levels established in May. The exception was in aluminum for which the demand continued undiminished and prices advanced fractionally. Type scrap also sold well. High freight rates, combined with great difficulty in securing space, made export trade almost prohibitive in most cases. After the Government price for lead was announced, fractional advances in composition and lead scrap were noted and a fair volume of business was transacted. In the latter half of the month transactions were spasmodic owing to the uncertainty of Government prices to be paid for major metals. Copper weakened slightly. In the closing week, the general opinion was that prices would not further advance.

WATERBURY AVERAGE

The average prices of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn.:

Lake Copper, 1916—Average for year, 28.77. 1917—January, 32.25. February, 35.25. March, 35.50. April, 32.75. May, 32.00. June, 32.50.

Brass Mill Spelter, 1916—Average for year, 17.725. 1917—January, 13.05. February, 13.80. March, 13.45. April, 11.85. May, 11.05. June, 10.85.

JUNE MOVEMENTS IN METALS

COPPER.	Highest.	Lowest.	Average.
Lake	32.00	30.50	31.35
Electrolytic	33.00	32.25	32.569
Casting	31.00	29.50	30.356
TIN	64.00	60.50	62.087
LEAD	12.25	11.25	11.869
SPELTER	9.67½	9.17½	9.453
ANTIMONY	23.00	17.75	19.775
ALUMINUM	61.00	57.00	59.85
QUICKSILVER (per flask)	$96.00	$80.00	$84.85
SILVER (cts. per oz.)	78½	74⅞	76.935

Metal Prices, July 9, 1917

NEW METALS.

	Price per lb.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Lake, carload lots, nominal	31.00
Electrolytic, carload lots	31.50
Casting, carload lots	29.50
TIN—Duty Free.	
Straits of Malacca, carload lots	62.50
LEAD—Duty Pig, Bars and Old 25%; pipe and sheets.	
20%. Pig lead, carload lots	11.30
SPELTER—Duty 15%.	
Brass Special	9.55
Prime Western, carload lots, nominal	9.175
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½ per lb.	
Small lots, f. o. b. factory	65.00
100-lb. f. o. b. factory	62.00
Ton lots, f. o. b. factory	58.00
ANTIMONY—Duty 10%.	
Cookson's, Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	17.25
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad valorem.	
Shot or Ingots	50 and 55c.
ELECTROLYTIC—5 cents per pound extra.	
MANGANESE METAL	Nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	$2.25
BISMUTH—Duty free	$3.00
CADMIUM—Duty free	nominal $1.50
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	$2.25
QUICKSILVER—Duty, 10% per flask of 75 pounds	$90.00
PLATINUM—Duty free, per ounce	$105.00
SILVER—Government assay—Duty free, per ounce	.73⅜
GOLD—Duty free, per ounce	$20.67

INGOT METALS.

		Price per lb.
Silicon Copper, 10%	according to quantity	53 to54
Silicon Copper, 20%	" "	55 to60
Silicon Copper, 30% guaranteed	" "	60 to65
Phosphor Copper, guaranteed 15%	" "	75¾to77¼
Phosphor Copper, guaranteed 10%	" "	74¼to75⅜
Manganese Copper, 30%, 2% Iron	" "	60 to64
Phosphor Tin, guaranteed 5%	" "	76 to77
Phosphor, Tin, no guarantee	" "	55 to60
Brass Ingot, Yellow	" "	23¼to26
Brass Ingot, Red	" "	28½to31
Bronze Ingot	" "	29 to31
Parsons Manganese Bronze Ingots	" "	33½to35
Manganese Bronze Castings	" "	39 to48
Manganese Bronze Ingots	" "	28 to34
Phosphor Bronze	" "	34 to36
Casting Aluminum Alloys	" "	45 to47

OLD METALS.

Dealers' Buying Prices.		Dealers' Selling Prices.
25.00 to 29.00	Heavy Cut Copper	28.00 to 30.00
26.00 to 27.50	Copper Wire	28.00 to 30.00
23.50 to 24.00	Light Copper	26.00 to 27.00
22.50 to 23.00	Heavy Mach. Comp	26.00 to 27.50
16.00 to 16.50	Heavy Brass	17.50 to 20.00
12.50 to 13.50	Light Brass	14.50 to 17.00
16.50 to 17.00	No. 1 Yellow Brass Turning	22.00 to 25.00
19.00 to 20.00	No. 1 Comp. Turnings	18.50 to 20.00
9.00 to 9.75	Heavy Lead	9.75 to 11.00
8.50 to 7.00	Zinc Scrap	7.50 to 8.00
23.00 to 23.50	Scrap Aluminum Turnings	25.00 to 25.50
33.00 to 34.00	Scrap Aluminum, cast alloyed	36.00 to 37.00
49.00 to 50.00	Scrap Aluminum, sheet (new)	52.00 to 53.00
39.00 to 40.00	No. 1 Pewter	45.00 to 48.00
30.00 to 32.00	Old Nickel	34.00 to 36.00
23.00 to 25.00	Old Nickel anodes	26.00 to 27.00

PRICES OF SHEET COPPER.

Mill shipments (hot rolled) ..... 40c. base net
From stock ..... 42c. base net

SIZE OF SHEETS. Width.	LENGTH.	64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
		Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Not longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

Metal Prices, July 9, 1917

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect May 24, 1917.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.36¼	$0.39	$0.41¾
Wire	.36¼	.39	.41¾
Rod	.34¼	.39¾	.42¾
Brazed tubing	.43½	——	.49¼
Open seam tubing	.43½	——	.49¼
Angles and channels	.43½	——	.49¼

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.38¼	$0.41	$0.43¾
Wire	.38¼	.41	.43¾
Rod	.36¼	.41¾	.44¾
Brazed tubing	.45½	——	.51¼
Open seam tubing	.45½	——	.51¼
Angles and channels	.45½	——	.51¼

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

BARE COPPER WIRE—CARLOAD LOTS.

34½c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	43c.	per lb. base
100 lbs. to 300 lbs. in one order	43½c.	" "
Less than 100 lbs. in one order	45c.	" "

PRICES FOR SEAMLESS BRASS AND COPPER TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, — per lb.
Seamless Copper Tubing, — per lb.

For other sizes see Manufacturers' List.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5

Due to fluctuations of the metal market we are unable to quote these prices.

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	40½c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	36c.	" "
Muntz or Yellow Metal Rectangular sheets other than sheathing	43c.	" "
Muntz or Yellow Metal Rod	36c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 65c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES OF NICKEL ANODES.

85 to 87% purity	50c.	per lb.
90 to 92% "	52½c.	" "
95 to 97% "	55c.	" "

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Base price, 60c.

We are unable to quote these prices, but they can be had upon application to manufacturers and dealers.

PRICE LIST SEAMLESS ALUMINUM TUBING.

We are unable to quote these prices, but they can be had on application to manufacturers and dealers.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

We are unable to quote these prices.

PRICES OF SHEET ZINC.

Duty, sheet, 15%.

	Cents per lb.
Carload lots, standard sizes and gauges, at mill	19 cent basis, less 8%
Casks, jobbers' prices	21.00
Open casks, jobbers' prices	21.50

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	48½c.	10%	53c.
8%	49½c.	18%	53½c.
10%	49¾c.	20%	55¼c.
12%	51½c.	25%	63c.
15%	52c.	30%	68½c.

GERMAN SILVER WIRE.

Quality.	Net per lb.	Quality.	Net per lb.
5%	50c.	15%	58c.
8%	52c.	16%	58½c.
10%	54c.	18%	60½c.
12%	56c.	30%	76c.

The above Base Prices are subject to additions for extras as per list printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 3c. over Pig Tin. 50 to 100 lbs. 4c. over, 25 to 50 lbs. 5c. over, less than 25 lbs. 10c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.

PRICES OF SOME METAL INDUSTRY CHEMICALS AND MATERIALS.

Phosphorus—Duty free, according to quality	Nominal.
Nickel Salts, Single bbl.	14c. per lb.
Nickel Salts, Double bbl.	11c. " "
Sodium Cyanide	37c. " "
Silver Nitrate, 100 oz. lots	52c. per oz.
Sodium Carbonate (Sal Soda)	.05c. per lb.

Prices for Cotton Buffs.

Open buffs per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base $40.00
14 " 20 " 64/68, "	" 52.50
12 " 20 " 84/92, "	" 47.55
14 " 20 " 84/92, "	" 61.70

Sewed buffs per pound.

Bleached and unbleached	base 34c.
Colored	" 31c.